

# The Chemical Age

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**NOTICES:**—All communications relating to editorial matter should be addressed to the Editor who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Other communications relating to advertisements or general matters should be addressed to the Manager.

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## Not Proven

THE effect of the long and rather intricate report of Lord Sumner's Committee of Inquiry into the formation and financial arrangements of the British Cellulose and Chemical Manufacturing Co., Ltd., may, perhaps, best be summed up in the words—not proven. In the opinion of the Committee, to quote the concluding sentence of the report, "there has been neither favouritism nor corruption, and the official action taken has been throughout such as appeared to the Departments concerned the best that was open to them under the circumstances." The committee are careful to refrain from expressing approval of everything that was done, but, in the light of this clear finding on the main issue, the rest is matter of detail. At the same time some of the detail is far from unimportant, and though the judgment of the committee is always strictly judicial, the facts appear to be fully set out, so far as they were admitted to come within the terms of reference.

The present report, as regards details of contracts and financial data, does not add very much to the Fifth Report of the Select Committee on National Expendi-

ture, but the latter is much more outspoken in its criticisms, and the two reports might well be studied together. As the committee point out, after the publication of the Fifth Report, "criticism was particularly attracted to the two facts that the Company had received much official support, including loans of public money, priorities, contracts and an Excess Profits Duty concession on the one hand, and on the other, that its six-penny shares appeared to be assumed to have become quickly worth £14 10s. each. Hence a connection between these facts was strongly suggested, which alike involved the personal credit of the managers of the Company's affairs and of the Departmental officials concerned. The contrast between the nominal capital of the original Company and that of the Parent Company is indeed so glaring that, for much of the criticism to which they have been exposed, we think that the promoters and others connected with the Company's financial arrangements have only themselves to thank. In other respects, however, less than justice has been done them. If all the facts, which we have sifted with so negative a result, had been available last year to the critics of the Company and its proceedings, we think that their conclusions would, to say the least, have undergone large modification." Again, the Committee think it incumbent upon them to call attention to a minute passed at a meeting of the Company's directors on January 31, 1918, under which a sum of £4,500 per annum, as from January 1, 1918, was voted to each of the managing directors, Drs. Camille Dreyfus and Henri Dreyfus for "living and entertainment expenses," and a sum of £5,000 was voted to the chairman, Colonel Grant Morden, for similar purposes, it being expressly agreed that no detailed account of these expenses need be presented. And again the Committee remark: "We have no evidence that these sums were put to any improper use, and only mention the fact lest it might appear to have been overlooked." This is typical of the spirit in which the Committee have discharged their task. One cannot help feeling that they might occasionally have thrown more light on the subject under consideration, but that they refrained from doing so because "it was not their job," and always interpreted their terms of reference in the strictest legal sense. On the main issue, however, they find the suspicions and criticisms unsubstantiated, and there the matter may now rest.

## Chemical Manufacturers' Position

THE question of real interest to the public and to the chemical industry is why the resources of British chemical manufacturers were not taken advantage of. The answer seems to be that there were too many cooks, the responsibility being continually shifted from one controller or department to another, and so initial mistakes were perpetuated. Why, for instance, should the Trench Warfare Department—of all departments—be suddenly vested with the control of acetic acid? The

number of controllers and departments consulted or "interviewed" is truly bewildering, and, judging by the number of committee meetings and consultations that were necessary, the delay in arriving at decisions is not surprising. If anything, credit is due to the Cellulose Company for its courage in often getting on with the work without official sanction.

The principal lesson to be learnt from the report is, to our mind, that a new industry cannot be created without a proper nucleus. The Cellulose Company possessed some continental manufacturing experience, but seems to have almost courted delay by starting *de novo*, chiefly with an imported technical staff, who lacked the necessary experience of British labour and manufacturing conditions. Moreover, the promoters of the company, according to the report, had no practical knowledge of the manufacture of cellulose acetate; to complete their works and to start manufacture it ultimately became necessary to borrow charge hands and experienced chemists from the Ministry of Munitions, and also to obtain the advice of their selected engineers and others.

The report states that it was the policy of the Government generally to discourage the duplication of plant, and that no British chemical concern possessed a plant in being which could have been utilised rapidly for the production of considerable quantities of cellulose acetate. We do not agree with these views, or with the statement that leading manufacturers like the United Alkali Company and Courtaulds could not have reached the producing stage quickly or efficiently. We need only take the parallel cases of synthetic phenol and TNT manufacture to demonstrate that such new and unfamiliar processes are those in which British manufacturers *possessing the necessary trained staff, organisation, and labour nucleus*, achieved the apparently impossible, and it is known that for these manufactures duplication of plant was certainly not discouraged. Messrs. Courtaulds were, perhaps, particularly suitable as being accustomed to dealing with cellulose products, and we think that it was a mistaken policy not to give them and the United Alkali Company at least an opportunity, admittedly at a very small relative cost, of demonstrating their ability to manufacture quickly and efficiently. Above all, it was desirable to encourage rather than to discourage competition, with a view both to a control of prices and to a post-war development.

Now that the matter is no longer *sub judice*, the Company, as well as its critics, will be free to ventilate their grievances. A clear statement as to the Company's programme, the cost and quality of their product, and their operating efficiency, might do good, and we feel sure that disappointed British manufacturers will, as soon as the patent situation is cleared up, find no difficulty in competing. Relieved of the delays and difficulties of starting manufacture during the stress of war and of Government control, and profiting by the experience already gained, it should, on their own showing, be possible to build new plant at lower cost, and to operate it efficiently. Anything in the nature of recrimination seems to us unnecessary, as the acid test of supremacy is, as always, efficiency in purchasing and manufacturing organisation. A firm that buys and manufactures a high grade product at the lowest possible cost need never fear competition.

### Chemical Compendia

IN the new issue of the *Journal* of the Society of Chemical Industry, two correspondents deal with the question of publishing English or Anglo-French chemical compendia. Mr. J. J. Bloch resents the idea of once more copying the Germans, and producing an English Beilstein or Richter. He favours instead the idea of "an always-up-to-date lexicon," in the form of an adaptation of the card-index system, as suggested to him by a French chemist, Dr. R. Padova, of Marseilles. A card-index, he claims, is eminently suitable both for an organic and for an inorganic lexicon. Subscribers all over the world would receive every month new cards to keep it up to date by the insertion of new compounds, or new cards to replace old ones, when the information conveyed by them had become obsolete. No new edition would be needed, but a standing committee of the Inter-Allied Chemical Federation would be constantly revising the work, sending out new cards or simply gummed slips for correction purposes. An hour monthly is the maximum amount of time each librarian would have to spend to keep the index up to date. Such a work would be invaluable for research, as the student could always be sure to find even the latest information. The only objection to this scheme is that it would require a special piece of furniture in each library; a trifle for a reference compendium, and if the cards would take up more room than an edition of Richter, they would occupy less than two editions or more. The cards could be printed in English, French, Italian, and even German, the chemical formulæ used for the classification being international; and the method could be used for an index of literature, giving only the chemical and physical properties of the compounds, where and when described, etc., and also for a more readable compendium of literature selected by the most eminent Inter-Allied chemists, and according to the latest accepted opinions. There would also be room for a compendium of patent literature, made on similar lines, for organic and inorganic chemistry, which, if classified by subjects, and properly commented upon, should prove a more valuable work even than Friedländer.

Professor J. B. Cohen, on the other hand, pleads that the arrangement of Beilstein and Richter, so far as organic chemistry is concerned, could not be improved upon. The work could be done in co-operation, say, through representatives of the participating countries acting as editors, with their staffs of assistants working under one roof. The building might be the one projected for a central library and reading room. In regard to abstracts, he suggests that the most economical method of dealing with them would be for contributors of papers to the Inter-Allied Journals to be obliged to furnish their own abstracts, which, together with other abstracts, should be edited and published from the central bureau at stated intervals after the manner of the *Zentralblatt*. This *Zentralblatt* would, like its German prototype, contain abstracts of every paper, including patent literature. The patent literature might be classified and republished *in extenso* in the form of Friedländer publications, not only for one, but possibly for different industries. The question of language would, he thinks, be fully met by limiting publication to French and English, one or other, or both languages,

and the cost would be greatly reduced by not extending the number.

We are glad to find Professor Cohen supporting the suggestion, which we put forward strongly some weeks ago, that the Allied Governments "might contribute substantially to the cost of these publications as a graceful acknowledgment of the gratuitous services rendered by the chemists of the Allied countries." The sooner the better the Chancellor of the Exchequer is approached by the most influential deputation that can be got together, representing all the organised bodies concerned in chemical science and industry.

### Germany's Chemical Activities

THE *Times* gives prominence to a statement made by Dr. E. C. Worden, the explosives chemical expert of the United States Bureau of Aircraft Production, Washington, who has just completed a tour of German chemical works, that "Germany has solved the problem of the fixation of nitrogen as a commercial undertaking on a gigantic scale. In future, from the point of view of agricultural fertilisers, she is independent of any blockade. Furthermore, the plant used in the process can be turned at the shortest notice to the manufacture of high explosives." At first sight this might be taken as a discovery of something quite new in chemical organisation, whereas Germany's practice of adapting her chemical industry to military ends is familiar knowledge. In our first issue, Professor Henry Louis dealt very directly with this particular question, pointing out that it was the fixation of nitrogen and the dephosphorisation of steel which from the German side made the war possible. "The war," he said, "was really based on applied chemistry, for the two facts which enabled Germany to go to war were (1) that an English chemist discovered how to make 'basic' steel from phosphoric iron ores, and (2) that Mr. S. Eyde, a Norwegian electrician, had practically applied the English discovery of producing nitric acid from atmospheric nitrogen."

Professor Louis might almost have had Dr. Worden's statement in view, in the caution which he added against treating Germans as the unchallenged leaders of chemical science and industry. "People," he said, "talk of the process for the production of synthetic ammonia as the Haber process, it being one of the German principles that every German who improves, develops, or applies someone else's process shall at once christen it by his own name and claim it for Germany. But the first patents for the synthesis of ammonia from its elements by the use of catalysts were French and English; Charles Tellier took out patents for this as far back as 1865; an important patent was taken out for the same purposes in Norway in 1896, and again by Le Chatelier in France in 1901 for the employment of high pressures to increase the rate of combination of the elements. It was only Germany's pressing need for nitrates to make her warfare possible that caused her to spend vast sums in the direction of elaborate factories for carrying out these already well-known processes upon a manufacturing scale, and thus complete the second link in the chain with which Germany intended to fetter the world. Until the two things I have mentioned had

been done Germany could not possibly have gone to war."

While not at all inclined to ignore Dr. Worden's statement of Germany's preparations for the recovery of her chemical trade, it is possible that, during a tour, in which necessarily one sees things largely from the outside, he has "discovered" a little too much. It is certain that the large works which he describes could not have sprung up since the Armistice. They must have been in existence before, and in accordance with the German plan they were no doubt used throughout the war for the production of explosives, as, indeed, they were always intended to be when the emergency arose. So far as we can see, there is no great scientific revelation in what Dr. Worden found in Germany—science, there, has long been treated as the handmaid of war. But there are two points of great industrial and commercial interest. The first is the ample size and quality of the German technical staffs. The second is that the employees work in two shifts of twelve hours each. We do not think that in the end a working day of twelve hours can be good for industry or for the workman; but it is good so far as it means that the German workman recognises the importance of production, and is prepared to pay a considerable physical tax in order to secure it. It would be a service to the British workman to convince him of what we shall all have to learn—that a war of the length and costliness of that just concluded cannot be followed by a picnic either for master or man.

### Bonuses on Research Work

THE important conference of Research Organisations, reported in this issue, emphatically turned down a suggestion that bonuses should be awarded on the results of research work. This decision, we think, will be warmly endorsed by all concerned in scientific investigation. To dangle before the eyes of every student a monetary reward for every result he discovers is almost a vulgarisation of the spirit of research, and tends to degrade a high vocation into a mere money-making pursuit. Even apart from this sentimental objection, there is the practical difficulty of allocating the financial reward to the right person and in the right proportion, for in scientific research it is particularly true that one may reap where another sows. The fairer and more dignified course is to provide the research worker with a salary sufficient to enable him to give his mind, without pecuniary distractions, to the work in hand, and the opinion of the conference followed this line. Another proposal discussed by the conference to establish a central Records Bureau in connection with the Research Associations now at work was received with general favour. The Associations, while naturally not surrendering their rights in their own work, recognise that results of general scientific or commercial value cannot or ought not to be hid under a bushel. If the mutual suspicion between commercial interests needs to be broken down in the larger public interest, scientific bodies themselves must set the example, and the setting up of a Records Bureau, intended in some degree to provide for the interchange and co-ordination of knowledge, is one useful step in the right direction.



# The British Cellulose Company

## Full Text of the Report of Lord Sumner's Committee of Inquiry

As briefly announced in our last issue, the report of the committee appointed last year by the Chancellor of the Exchequer "to inquire into and report upon the formation and financial arrangements of the British Cellulose and Chemical Manufacturing Co., Ltd., and associate companies, and upon their relations with Departments of the Government," was published on Thursday week (Cmd. 3d.) The committee consisted of Lord Sumner (chairman), Lord Inchcape, and Lord Colwyn. They began hearing witnesses on November 27, 1918, and after holding seventeen sittings and examining thirty-two witnesses, concluded this portion of their task in February of this year. They comment on the absence in the United States during this period of Dr. Camille Dreyfus, and state that although the Company made endeavours to bring him to this country (the committee much desiring his attendance), he did not return until nearly the end of July. His failure to return earlier caused a loss of several weeks in June and July, and the explanations he gave to the committee are described as "very unsatisfactory." We give below practically the full text of the Report:

### 1.—Formation of the Company

The British Cellulose and Chemical Manufacturing Co. was registered in England as a private company on March 18, 1916, with the object of undertaking the manufacture of cellulose acetate and other chemical substances. It was to acquire the Dreyfus British Patent Rights, and eventually to take over the uncompleted portion of a contract made between the War Office and Dr. Camille Dreyfus in July, 1915, and to erect and equip a factory for such purposes. It was promoted by Lieut.-Colonel Walter Grant Morden (then Staff Officer to Sir Sam Hughes, the Canadian Minister of Militia), Sir Arthur Trevor Dawson (a Director of Vickers, Ltd.), and Mr. Edward Robson (a Director of Pinchin Johnson & Co., Ltd.). None of these gentlemen appear to have had any practical knowledge of the manufacture of cellulose acetate. Its formation was the result of a visit to Basle by Colonel Morden and Mr. Robson, on the introduction of a Mr. Bloch. There they met Messrs. Camille and Henri Dreyfus, who, with Captain Alexandre Clavell, were the principal shareholders in a Swiss firm of chemical manufacturers called the Cellonite Co. (Dreyfus & Co.), and arranged on behalf of the promoters to provide the necessary finance, whilst the Swiss group were to furnish the technical skill. On this basis Dr. Camille Dreyfus came to England with his brother in February, 1916.

Under the agreement between the promoters and the Swiss group, each of whom were represented by separate solicitors, the capital of the Company was intended to be £400,000 in £1 shares, but, as the terms provided for an equal division of the shares between the two groups and for the raising of the requisite cash by a debenture issue, it was arranged to fix the nominal capital at £4,000 (presumably with the object of saving registration fees and stamp duties), and to divide this nominal capital into 80,000 shares of 1s. each, the promoters also agreeing to the registration within two years of a new company, with a capital of £400,000, to acquire the whole of the shares in the £4,000 company. The nominal share capital with which the Company was in fact registered was £4,000, divided into 160,000 shares of 6d. each, and no alteration has since been made. Under the arrangements between the parties each group was entitled to have four directors on the board, and effect was given to this arrangement by incorporating it in the Articles of Association and dividing the capital into equal amounts of A and B shares for this purpose. The purchase price payable to the Swiss group was £43,100, out of which approximately £2,000 went back to the Company as subscription for the shares allotted to the Swiss group, and £30,000 as subscription by them for a like amount of

debentures, so that the cash consideration receivable by the Swiss group was something over £10,000.

### Issue of Debentures

In addition to this £10,000 the Company had to raise a further sum of about £80,000, which was the amount then estimated by Messrs. Dreyfus as necessary for the erection of the proposed factory. To obtain this sum of £90,000 the Company immediately after its registration issued debentures at a small discount, the subscription of which was procured in part from friends and associates of the promoters, and the bulk of the remainder from outsiders, through the intermediary of a firm of solicitors and a firm of stockbrokers, the inducement to the subscribers to the debenture issue being the right to subscribe at par for a proportionate number of shares in the Company, which proportion, however, varied as between the subscribers. In some few instances subscribers for debentures received no shares, and conversely in some cases subscribers for shares took up no debentures. So far as we have been able to ascertain no prospectus or circular was issued by the promoters or Company inviting subscriptions for either the debentures or shares.

The ultimate result was that approximately one-fourth of the share capital was taken up by the subscribers for debentures. The debentures were not definitely secured till November 15, 1916, 79,998 shares went to the Swiss group, and the remaining 41,079 shares were received by the promoters as their promotion profit.

Sir A. Trevor Dawson, who took up £1,000 debentures, was the only promoter who subscribed for debentures in the Company. The debentures were not definitely secured till November 15, 1916, when a Trust Deed was executed in favour of the Prudential Trust Co. (of Canada), Ltd., as Trustee, under which a specific charge was to be given on certain land at Spondon, near Derby, and a floating charge on the undertaking of the Company. The original security was to cover £130,000 debentures, but the Company took power to issue further debentures under that security for a total aggregate of £300,000, and the Trust Deed and form of debenture contained a condition for the exchange, in certain events, of such debentures for like debentures in a reconstructed Company. The debentures were issued without Treasury sanction. Shortly after the incorporation of the Company eight directors were nominated, in accordance with the provisions of the Articles, four for each class of shares, of whom Sir A. Trevor Dawson, Colonel Morden, Mr. Robson, and Mr. Bloch were nominated by the "A" shareholders, and Captain Clavell, Dr. H. Dreyfus, Dr. C. Dreyfus, and Mr. Rudolph La Roche (described as a banker, of Basle) were nominated by the "B" shareholders. Colonel Morden was appointed Chairman.

In connection with the original subscription of the shares and debentures, the Prudential Trust Co., Ltd., which is a Canadian incorporation, having a London office and London board composed of Col. Morden and another director, was introduced for the purpose of holding in its own name shares of the Company beneficially owned by certain persons interested therein. Two reasons were given to us for this: one that it was thought desirable to avoid the possibility of filling up the limited number of shareholders which a private company could under the Companies' Acts have on its Register of Members; and the other that, as the promoters and the Swiss group had mutually agreed to retain the voting control in their hands, this was a convenient way of keeping together the bulk of the shares held by the promoters.

### 11.—Financial arrangements and Associated Companies

The following companies have, from time to time, been associated with the Company:—Vickers, Ltd., the Chilworth Gunpowder Co., Ltd., Nobels Explosives, Ltd., and the British Cellulose and Chemical Manufacturing (Parent) Co., Ltd. Vickers, Ltd., were original subscribers for shares and debentures of the Company, both as a corporation and through their directors, and in August, 1916, transferred 3,333 of their shares to Messrs. William Beardmore & Co., Ltd. In November, 1916, Vickers, Ltd., in conjunction with the Chilworth Gunpowder Co., Ltd., and Nobels Explosives, Ltd., entered into an agreement with



the Company to establish on profit-sharing terms a branch of the Company, for the manufacture of synthetic acetic acid on a commercial scale, subject to the process being proved to be experimentally sound. In this joint venture the Company was to provide the technical skill, and the three other contracting companies (hereinafter referred to as "the Explosives Syndicate") were to provide £10,000 for the experimental plant, and, in the event of the full commercial scheme being undertaken, capital up to £300,000. The Explosives Syndicate duly paid the £10,000, but the experimental plant had not been erected by April 12, 1917, on which date Dr. Camille Dreyfus reported to a directors' meeting that he had opened negotiations with the War Office for the installation of plant, and at this meeting Sir Harry McGowan was appointed a director of the Company. About this time, and, apparently, in this connection, Sir Harry McGowan, Mr. F. J. Shand, Mr. H. Moncrieff, and Sir Vincent Caillard became shareholders of the Company, the first three by transfers dated March 17, 1917, and the fourth by transfer dated April 13.

At the next directors' meeting Sir Harry McGowan, on learning from Messrs. Dreyfus of the negotiations with the Government for the contract for 2,500 tons of solvents, offered to recommend the immediate provision by the Syndicate of £200,000 for the acetic acid scheme, if a satisfactory contract were obtained. This acetic acid contract was definitely concluded in June, 1917, and on June 30 a supplemental agreement was made between the Explosives Syndicate and the Company, providing for the abandonment of the proposed experiment and committing the Syndicate to an expenditure of up to £300,000 on the full commercial scheme. Colonel Morden and Messrs. Dreyfus on behalf of the Company, Sir Trevor Dawson on behalf of Vickers, Ltd., Sir Harry McGowan on behalf of Nobels Explosives, Ltd., and Captain Tulloch on behalf of the Chilworth Gunpowder Co., Ltd., were subsequently appointed a Committee to supervise and control the expenditure. Under this agreement the Explosives Syndicate provided the full £300,000.

On July 25, 1917, a further agreement, following upon negotiations which appear to have commenced in the preceding January, was made between the same parties for the development, under the Dreyfus process, of other products, including artificial silk and synthetic indigo, under which the cost of the experimental plant was limited to £45,000, and of the full scheme to £835,000, the monies in each case to be provided by the Explosives Syndicate. The Explosives Syndicate, in due course, paid £15,000, part of the £45,000 contemplated by the Agreement, but the Company seems to have made no serious attempt to carry out its terms.

#### The Question of Recapitalisation

As early as January, 1917, the question of the recapitalisation of the Company came before its directors, in view of the assumed appreciation of the Company's assets, and Sir William Bull was consulted, but no definite steps were taken until September, 1917, when negotiations were entered into with the Beecham Trust, Ltd. These negotiations contemplated the formation of a new company, with a capital of £3,200,000 in £1 shares, equally divided into Preference and Ordinary shares, and the underwriting of the Preference shares by the Beecham Trust, who were also to buy 400,000 of the Ordinary shares, subject to Treasury consent and Stock Exchange permission to deal. These negotiations were followed shortly afterwards by proposals for the formation of the new company with a capital of £2,000,000 in £1 shares, and the issue by such new company to the Beecham Trust of £2,000,000 debentures, subject to the consent of the Treasury being obtained to a public issue and to the extension to the new Company of the financial concession hereafter mentioned. The Company's minutes indicate the intention to issue the share capital as to £1,600,000 to the Company's shareholders, at the rate of £10 per share in the existing Company, and as to £355,000 to the Explosives Syndicate, in consideration of the cancellation of the acetic acid arrangements. The Explosives Syndicate offered to cancel the other agreement in consideration of two years' option over 300,000 additional shares at £2 10s. per share. The nominal share capital, it was explained to the Treasury, was so fixed because the Beecham Trust insisted on a figure at least equivalent to the amount of the proposed debentures, and so far as we have been able to ascertain no valuation was made of the Company's assets for the purpose of defining the amount. No valuation was produced to us.

Towards the end of November, 1917, the Treasury Issues Committee definitely refused consent to a public issue, but in December, 1917, promised reconsideration, when the Company

had obtained its building licences and priority for plant. The Company, however, abandoned the proposed arrangement with the Beecham Trust, and then entered upon negotiations which ultimately resulted in the formation of the British Cellulose and Chemical Manufacturing (Parent) Co., Ltd. (hereafter referred to as "the Parent Company"). In these negotiations, in which Vickers, Ltd., took a prominent part, the Central Mining and Investment Corporation, Ltd., was approached to take an interest in the Parent Company, and that Corporation was to take up 10,000 shares at 21s. each in the Parent Company, and to lend the existing Company £190,000, Sir Lionel Phillips being appointed to the Board as the representative of the Corporation. On the formation of the Parent Company the loan was to be transferred, and the Corporation was to have the option of converting it into 190,000 shares at 21s. each, and a further option over 200,000 shares at 25s. each, and was entitled to receive from Vickers, Ltd., a bonus of 40,000 shares on the exercise of either of these options.

#### "Parent" Company's Registration

The Parent Company was registered as a private company under the Companies' Acts on March 20, 1918, with a nominal capital of £3,500,000, divided into £1 shares all of one class, and its share capital was allotted as follows:—

|  |                  |
|--|------------------|
| To two shareholders subscribing the Memorandum of Association of the Company   | 2                |
| To the shareholders in the existing Company at the rate of £14 10s. per 6d. share, less fractions                      | 2,319,998        |
| To the Explosives Syndicate in respect of £355,000 cash found by it and of £100,000 additional cash provided by Nobels | 780,000          |
|  | <hr/> £3,100,000 |

As a result of the transaction resulting in this allotment of shares the Parent Company did not acquire the assets of the existing Company, but became entitled to its shares, and was to receive a sum of £454,000 cash, and the Prudential Trust was again introduced and received £1,000 remuneration for its services. To carry through the transaction, agreements were made for the acquisition of the sixpenny shares, and for the cancellation of the two agreements with the Explosives Syndicate on the basis of the return of the £325,000 found by the Syndicate thereunder and the sale to the Syndicate of the 780,000 fully paid shares at the price of £455,000. Apparently one of the objects in view in the formation of the Parent Company was to finance the existing Company, for the books in fact show that the Parent Company promptly lent to the existing Company the balance of cash remaining in its hands as the result of these operations. The Central Mining and Investment Corporation does not appear to have taken up the £10,000 shares, and on October 29, 1918, called in its loan, and on the same date Sir Lionel Phillips sent in his resignation as a director.

In the year ending June 30, 1917, during which over £96,000 appears to have been expended upon assets other than those covered by the original purchase agreement, the Company supplemented the cash obtained from the issue of its shares and debentures and the experimental fund derived from the Explosives Syndicate by borrowing from the Union Bank of Canada, the London manager of that bank being for a time a director of the Company, and subsequently a member of its Finance Committee. In the following twelve months the construction and equipment of the Company's factory were pressed forward, and in that year a capital expenditure was involved of nearly £1,700,000. Towards this expenditure the Explosives Syndicate provided the £300,000 and £15,000 already referred to, and the Union Bank of Canada gave a further credit of £200,000. The whole of the indebtedness to this bank was discharged, and in its place the London County and Westminster and Parrs Bank, Ltd., lent £250,000 and further fluctuating advances of £270,000.

The Ministry of Munitions, under the circumstances hereafter more fully detailed, lent, on a promise of security over a contemplated power station, the sum of £200,000 (of which the Company repaid over £35,000), and made a first payment of £235,000 under the terms of an agreement dated June 27, 1918. The remainder of the Company's finance was obtained as to £100,000 from the Corporation as already stated, as to £433,000 from the Parent Company, as to £36,000 from Messrs. Robert McAlpine & Sons (who were the contractors for the factory) on the security of certain plant, and as to £20,000 from the Lanca-

shire and Cheshire Insurance Corporation, Ltd., secured on a sum of £25,000 War Loan.

It will be observed that on the basis of the Beecham Trust scheme, which, if carried through, would have provided the Company with a considerable amount of fresh cash capital, the return to the shareholders of the Company in shares of the Parent Company was intended to be at the rate of £10 per original share, whilst under the actual scheme of the Parent Company, under which the additional cash available is only £100,000 in shares and £190,000 in loan, the return is at the rate of £14 10s. per share. In the events which have happened, however, the basis of capitalisation appears to be of but slight public importance, having regard to the fact that the only parties who could be prejudiced thereby were in the case of the Beecham Trust scheme, the Explosives Syndicate, and in the case of the actual scheme that Syndicate and the Central Mining and Investment Corporation. As regards both the Syndicate and the Corporation, each of these was represented on the Board of Directors.

#### Sixpenny Shares at £10 10s.

What the Parent Company's shares are really worth is a matter of complete uncertainty. Neither of the companies in question has ever had its shares quoted on any Stock Exchange. There were during 1917 and 1918 a number of dealings in the sixpenny shares at prices ranging from £1 to as much as £10 10s. per share. They took place within a narrow circle, and although it is plain that on some ground or other the buyers fancied that the Company's prospects must be very encouraging, the precise basis for this hope we have not been able to discover. In one case, at any rate, according to the evidence given to us, the whole transaction was a mere gamble in a club. It may be that a chemical product, of which most people knew little or nothing, but of which it could be said that it was indispensable for aeroplanes, and that, too, in the middle of the war, would seem to some minds to offer illimitable prospects. We have investigated the transactions chiefly in order to see whether they contained any ground for suspecting that persons, whose influence might be supposed to be useful to the Company, were being illicitly propitiated, or that the persons who put such value on the shares did so because they believed that the Company would have the benefit of such illicit influence. We have failed to discover any grounds for such suspicions.

Again, and for a similar purpose, we thought it right to press for a specific explanation of the fact that the Company's shares were of so small a denomination as sixpence, and to inquire why sixpence was pitched upon in preference to any other amount. In fact, there seems to have been a change from an earlier plan for shilling shares, and the adoption of a capitalisation on a sixpenny basis was as sudden as it is unexplained. The answer to our questions was always the same, namely, that this denomination of shares was selected for the purpose of "defining the interests," but this explains nothing, for it must always be so. The effect of dividing the Company's capital into shares of a particular denomination is to define the interests as soon as they come to be allotted, and in the present case there is nothing to show that these interests were so minutely sub-divided as to require the adoption of a fraction of a shilling as the unit with which to define them. To us the matter remains unexplained, though not, we think, inexplicable, but its relevance for the purpose of our inquiry appears to be confined to the two points mentioned above. If there are persons who have reason to complain of representations made to them, or of the way in which they were induced to acquire their shares, or to part with their interests, they have their ordinary legal remedies, and the matter does not concern us. We have been unable to discover any evidence that the capitalisation of either Company was used to procure undue influence for the Company, or that the Company, in fact, enjoyed the benefit of any undue influence thereby, nor do we think that any material inference can be drawn from the great contrast between the nominal amounts of these shares or between the nominal amount of the original shares and the prices at which they were dealt in.

### III.—Relations with Departments of the Government

Although the contract of July, 1915, does not, strictly speaking, fall within our terms of reference, seeing that it was made with Dr. Camille Dreyfus prior to the formation of the Company, and was never in fact taken over by the Company, some information

in regard to its history is desirable for the purpose of appreciating in their true light the events which followed it in relation to the Company.

#### Cellulose Acetate and Aeronautical Work

At the outbreak of the war the use of cellulose acetate and certain necessary solvents in the manufacture of "dope" for aeronautical purposes was not widely known, and, indeed, the aeroplane programme itself was then on a small scale. After the outbreak of war, however, its value was more fully realised, and with the increasing growth in the aeronautical programme the question of supply became important. There were three well-known sources of supply, namely, the Bayer Co. of Germany, the Usines du Rhône of France, and the Cellonite Co. (Dreyfus & Co.) of Basle, Switzerland, of which the Bayer Co. was obviously not available to this country, whilst France would, naturally, have the first call on the output of the Usines du Rhône.

The first connection of the Swiss firm with the War Office dates from September, 1914, when their agent in England offered supplies. This was followed by a period of investigation by Mr. A. E. Turner, the officer then in charge of the Aeronautical Contract Branch of the War Office, who ultimately in July, 1915, issued a form of tender for 100 tons of cellulose acetate of British manufacture to three firms, including that of Dr. Camille Dreyfus. These three firms were the only concerns with which, up to that time, Mr. Turner had come in contact, except Cellon, Ltd., which had passed on certain tentative proposals for manufacture by two Frenchmen resident in Germany at the outbreak of the war, whom the French Government employed on their return to France after disposing of their German patent rights. One of the firms, to whom forms of tender were issued, replied that it was unable to tender. Another found difficulty in understanding the form of tender and the specification. Dr. Camille Dreyfus alone returned the tender, accompanying it with a letter, in which he made certain stipulations, and reserved the right to deliver 50 per cent. of the total quantity from Switzerland at a reduced price. This being the only tender, it was accepted.

The Company, having been registered in March, 1916, ultimately secured a site for its factory, and after a period during which plans of the proposed factory were prepared, commenced its erection in August, 1916. In the following October negotiations were undertaken by the Company for a supply contract, and on January 26, 1917, after samples of its products had been obtained, and the Inspection Department had reported that from this material "dope" of good quality and (given uniformity) economical in solvent could be made, the Company secured its first direct contract. This was for the supply of 40 tons of cellulose acetate, deliveries to be up to 1 ton per day, commencing when the factory was ready.

By this time the aeronautical programme of the British Government and of the Allies had undergone very large expansion, with the result that it had become urgently necessary to safeguard future supplies. Accordingly when this contract was entered into, Captain Sanders, the officer in charge of supply, when authorising the Contract Department to make it, directed that all assistance was to be given to the Company so as to expedite the completion of its works in order to avoid a shortage of cellulose acetate. Captain Frecheville, with Colonel Lowry (of the Canadian Forces), was sent to visit Spondon, and on January 31, 1917, reported that the delay in the completion of the works was due, among other things, to lowness of priority, poor quality of labour, and to the failure of contractors to carry out their contracts, and that he anticipated production to begin in six weeks, subject to the Company being supplied with certain apparatus and being given adequate labour and priority. Following on this report a further report, dated February 16, 1917, was, on Colonel Cormack's instructions, made by Captain Frecheville as to the action taken, and from this it appears that Captain Brand was specially deputed to take charge of labour and priority. The result of the Government assistance was that in the following April the Company began deliveries of cellulose acetate under its January contract, at first on a small scale, but subsequently in considerable and increasing quantities.

#### An Alternative Solvent for Acetone

Further anxiety was caused in the Department by the anticipation of a shortage of acetone, a very important solvent used in the manufacture of "dope" from cellulose acetate. The Company also appears to have anticipated difficulty in obtaining solvents, the main ingredient of which is acetic acid, and accord-

ingly it entered into the contract with the Explosives Syndicate of November 30, 1916, already referred to. In April, 1917, the Company put before the Ministry proposals for the manufacture of methyl acetate, as an alternative solvent for acetone, and, at the same time, expressed its willingness, if supported with priorities and sufficiently large contracts, to lay down plant for the production of synthetic acetic acid, which would involve the erection of carbide and electric power plant. At this date there appears to have been some doubt in the minds of the officials whether acetone or methyl acetate would be the more suitable solvent, and accordingly, when a contract was made on June 6, 1917, for 2,500 tons of solvents, it provided for the supply of definite quantities of methyl acetate and acetone, the balance in both to be in the Government's option, and it stipulated that the Inspection Department was to be satisfied of the suitability of the material for the manufacture of "dope." As before stated, when this contract was obtained, the proposed experiments in the manufacture of acetic acid were abandoned, and the Explosives Syndicate was committed to an expenditure of £300,000 on the full scheme.

In May, 1917, the Company's original cellulose acetate unit appears to have been almost completed. In that month the Company pointed out that with deliveries of 1 ton per day the 40 tons contract would last for a little over a month, and pressed for a new contract for 300 tons, and on June 6, 1917, it obtained a contract for 25 tons a month, terminable on notice and at a slight reduction in price as compared with the previous cellulose acetate contract.

For some time past the outlook in regard to the supply of cellulose acetate had been critical, and in order to meet the "dope" requirements recourse was had to supplies of acetate which had previously been rejected. Hitherto, apart from the comparatively small quantities provided by the factory at Spondon, the Aircraft Department had been obtaining its supplies partly from the Basle Company, and partly through the British Aviation Commission in Paris from the Usines du Rhône. The quantities obtainable from this latter source were always limited, and in June, 1917, broke down altogether in consequence of the increased demand of the French Government. The still further expansion of the aeronautical programme in this country increased the difficulties of the position.

To cope with this situation the Aircraft Department, which since February, 1917, had been placed in charge of the Ministry of Munitions, under Lord Weir, secured in July, 1917, the assistance of Brig.-General William Alexander, formerly a partner in a Scottish chemical firm, and then engaged in the Government factory at Gretna, and appointed him Director of Supply. The whole range of supply was divided into sections, and the section dealing with "dope" chemicals was assigned to Mr. John Radcliffe, who was brought by General Alexander from a Government factory, where he was then acting as chemist in charge of cutting down the consumption of raw materials.

#### "Nitrodope"

One of the first steps taken by General Alexander was to consider the manufacture at Gretna of "Nitrodope," as an alternative in the event of the failure of the cellulose acetate supply. On the one hand, the manufacture of "Nitrodope" was not dependent on this material, but on the other, its greater inflammability made it advisable to secure, if possible, supplies of acetate "dope." Accordingly, having ascertained that the Usines du Rhône could not be relied upon for his requirements, General Alexander summoned the directors of the Company to a Conference, at which they answered his complaints of their slow progress by the explanation that they were unable to obtain necessary materials. He thereupon informed the Company that he would have their works inspected to ascertain the facts, and that if he found that they were unable to deliver the supplies required, he would obtain them by means of a Government factory. Mr. Radcliffe was sent to inspect, and his report was considered on August 16, 1917, at a Conference attended by Lord Weir, General Cormack, General Alexander, Mr. A. E. Turner and Mr. Radcliffe. This Conference also considered the aeroplane programme, which was to be almost doubled by the following January and trebled by the following June, and after Mr. Radcliffe had explained that the Company had arranged to enlarge its plant to meet the increased programme, Lord Weir gave instructions that the work was to be proceeded with and that all necessary priorities were to be given.

#### A Loan of £200,000

Between the dates of these two Conferences the Company had applied to the Contract Officer, Mr. Turner, for a loan of £200,000 on the proposed power plant, and had pressed for an additional contract for cellulose acetate commensurate with the proposed extensions, explaining that these, when completed, would give a daily output of four tons. Mr. Turner referred this matter to General Alexander, who informed him of the decision arrived at by the second Conference to sanction the scheme for an ultimate daily output of four tons of cellulose acetate, including the power and carbide units, and left with him the question of a further contract. In the result a loan of £200,000 on the power plant was authorised and was duly made, and a contract was given to the Company for a further 700 tons of cellulose acetate. Up to June, 1918, this loan of £200,000 represented the only public funds, other than payments for supplies, which had been received by the Company, and of the £200,000 over £35,000 had by June, 1918, been recovered in accordance with the agreed terms for securing the loan.

Steps were then taken to acquire the necessary lands for the expansion of the works, and with the assistance of Ministry officials approximately 100 acres were secured. The company forwarded three building schemes, namely, the cellulose acetate extension scheme, the acetone plant scheme and the carbide factory and power station scheme, to Mr. A. E. Turner, and without waiting for formal sanction proceeded with the erection of the works. In fact, it was not until late in February, 1918, that licences were formally granted.

The difficulties in regard to the supply of acetic acid, which had apparently been foreseen by the Company, now became acute, with the consequence that on September 21, 1917, an order was made controlling its supply and vesting the control in the Trench Warfare Department. The Company alleges that in the result, whereas the previous contracts with the Government had been based on a price of £50 to £60 per ton, it was ultimately found that the controlled price charged by the Ministry was £160 to £190 per ton. With a view to economising the consumption of solvents, General Alexander had, in August, 1917, given instructions for the preparation of schemes for standard "dopes," both nitro and acetyl, and when acetic acid was controlled Mr. Radcliffe took up the proposal. It met, however, with considerable opposition from the technical officers, on the ground of the variability of the Spondon product, though they admitted its theoretical desirability, and it was only after considerable discussion, and on a reference to Sir Arthur Duckham, that a standard "dope" specification was decided on. Meanwhile, every effort to secure the needed output from the Spondon works was being made by General Alexander and his staff, who, in addition to obtaining the assistance of the Lands Branch to secure the land desired by the Company, intervened with the Trench Warfare Department to obtain the necessary supplies of acetic acid, supported the Company's application for building licences, and appointed officials to report on the progress of the Company's works, with a view to assisting it with priority and to securing provision of labour, &c.

#### The Works at Spondon

The entry of the United States of America into the war had placed a further strain on the Supply Department, for, apart from the British requirements, which were increased, it was proposed that American machines should be "doped" in this country. The Company was informed of these additional demands, and writing on December 20, 1917, to Sir Arthur Duckham, then Director-General of Aircraft Production, stated that arrangements were being made for the ultimate supply of cellulose acetate at the rate of eight tons per day. The letter was passed on to Lord Weir. In the following month, Sir Arthur Duckham, after calling for a general report on the Company, discussed the matter with the Departments concerned, with other officials visited the Spondon works and inspected the factory, particularly with a view to cutting down the works to the lowest point consistent with the demands of the Department. His opinion, as reported to Lord Weir, was that the whole of the works should be proceeded with in order to make the whole factory self-supporting, in view of the difficulties with which the Department was then faced, and on his instructions the Company was informed accordingly.

The Company, in reply, promptly applied for fresh contracts for the supply of cellulose acetate and methyl acetate on a scale commensurate with the proposed additional extensions, and these contracts were the subject of negotiations between the Company on the one hand and the Supply and Contracts Departments on



the other, but were never completed. No deliveries of methyl acetate had up to this time been made under the contract of June 6, 1917.

#### A Financial Concession

The readiness with which the Company met all demands for increased supply may be to some extent accounted for by a financial concession which had been granted shortly after the incorporation of the Company. The history of this concession is briefly as follows:— When the original contract of July, 1915, which provided for the supply of 50 tons of cellulose acetate manufactured in this country, was negotiated, it was in contemplation that a company would be formed in this country to undertake the manufacture. Dr. Camille Dreyfus got into touch with financiers and proposed to take over a small factory in the neighbourhood of London, but subsequently, finding its capacity insufficient, he abandoned these negotiations and returned to Switzerland. It was then that he was approached by Colonel Morden and Mr. Robson on behalf of the promoters, who had previously essayed without success the manufacture of cellulose acetate in this country through a small Company called "The Acetose Manufacturing Company, Limited," and in the result the arrangements for the promotion of the Company were made, which have been already described. Early in March, 1916, Colonel Morden, on the introduction of Sir A. Trevor Dawson, interviewed Sir Charles Harris, the Financial Secretary of the War Office, and put forward a request for exemption from Excess Profits Duty, to which Dr. Dreyfus attached great importance.

Sir Charles Harris at once proceeded to take the opinion of the Treasury authorities unofficially, and received a reply from Sir John Bradbury, in which the latter, whilst deprecating such a concession unless it was absolutely unavoidable, indicated what he considered the least objectionable form in which it could be granted. Some time later, Colonel Morden and Sir A. Trevor Dawson approached the then Chancellor of the Exchequer on the question of a concession as to Excess Profits Duty, the only result being a repetition of the views expressed by Sir John Bradbury in his previous unofficial letter to Sir Charles Harris.

After the Company had been formed and when preparations were being made for the commencement of the factory, the War Office inquired into the attitude of other Government Departments, and having ascertained that the Ministry of Munitions had adopted the practice of making grants to contractors, put forward an official application to the Treasury for sanction for this concession. Correspondence followed between the Treasury and the War Office, in which the Treasury explained its views, and placed upon the War Office the responsibility of deciding whether the concession was warranted by the importance of the supply, and the War Office, with the consent of the Treasury, and after obtaining the views of General Caddell and Sir David Henderson on the practical importance of an assured supply of cellulose acetate, eventually came to terms with the Company on November 17, 1916. The terms agreed upon provided for the refund to the Company of its capital expenditure on plant during the war up to a maximum equivalent to the Excess Profits Duty actually charged in respect of each year of working during the period of five years from the formation of the Company, subject to the Company agreeing to quote reasonable prices for all orders placed, and during the war to take orders only from Government Departments, Allied Governments, and private firms requiring supplies for Government purposes, this restriction being withdrawn on post-war orders, provided the direct and indirect requirements of the Government had been met at approved prices.

#### Committee's Comments on the Concession

We apprehend that it does not fall within our province to interpret the true meaning of this concession, the terms of which seem to have been variously construed, nor are we called upon to discuss whether it was politic or impolitic. It is, however, only fair to say that similar concessions and for similar reasons were being made; that the importance of a British supply of cellulose acetate was obvious, and the risk of dependence on a source of supply on the borders of Germany was great; and that, in a considerable measure, Dr. Dreyfus was in a position to command his own terms. Whether better terms could have been made with him we cannot tell, but time pressed, and the needs of the Air Force were paramount. In any case, the matter is now of little interest. It is obvious from the terms of the concession that before the Company could derive any advantage therefrom the

making of excess profits, and therefore of some profits, was an essential preliminary. The investigation we have caused to be made into the books and accounts of the Company confirms the statement of the Company's officials that while the concession was in force no profits at all were made, and the concession has, in fact, turned out to be a dead letter.

#### Claim for Higher Prices

The Company, in the beginning of 1918, during the negotiations for the new contracts, put forward a claim for increased prices in consequence of the increased cost of labour and of acetic acid and other ingredients. It desired an advance of 50 per cent. on the original contract prices for cellulose acetate, and a similar price under the proposed new contracts, but, as the Ministry declined to accept this figure, matters came to a practical impasse. At the same time, other Departments of the Ministry were dealing with various matters affecting the Company, viz., the provision of steel for extensions, a large housing scheme, and the sanction of the power plant, and in these circumstances a Conference was held on April 13, 1918, attended by representatives of the Finance, Contract and Supply branches of the Aircraft Production Department, and also by the Finance, Contract, Electrical Power and Housing Sections of the Ministry, and by the Munitions Works Board. This Conference considered the history of the Company and its position in relation to the Ministry, and arrived at the conclusion that, having regard to the proposed extensions and the difficulties about contract prices, it was desirable that the original financial concession of November, 1916, should be cancelled. Accordingly a Committee of Officials was appointed to negotiate with the Company. Meetings took place between the Ministry officials and certain Directors of the Company, with the result that new terms were ultimately agreed upon, and after investigation were sanctioned by the Treasury. These terms were embodied in heads of agreement dated June 27, 1918, which provided for the cancellation of the financial concession and of all the existing supply contracts, for the abandonment by the Company of all claims for increased cost of wages and material under the cancelled contracts, and for fresh supply contracts on the basis of periodical average cost, plus a fixed profit and a proportion, after the first six months, of any saving in cost, fixed rates of depreciation on building and plant being allowed for the purpose of ascertaining the average cost. By this agreement, the Ministry undertook to make loans to the Company against its expenditure on electric plant, and also to lend a fixed percentage of the Company's approved war capital expenditure on buildings and other plant up to the end of 1918, such loan to bear interest at one per cent. above Bank rate, with a minimum of five per cent. per annum, to be repayable within five years from the date of the agreement. Pursuant to these provisions, the Ministry had, up to the date of our appointment, advanced the sum of £485,000, and up to October, 1918, the sum of £900,000.

#### Company's Performance of Obligations

To this general outline of the Company's relations with Government Departments, a few remarks may be added as to the performance by the Company of its obligations. Undoubtedly, after the contract of July, 1915, was placed, the War Office was anxious to ensure the manufacture of cellulose acetate in this country, and relied on somewhat sanguine anticipations expressed by Dr. Dreyfus, which, however, were not realised. As previously stated, the factory was commenced in August, 1916, but the first deliveries under the Company's initial contract of 1917 only took place in April, 1917, and then at first only on a small scale. The excuse put forward to us on behalf of the Company was the difficulty in obtaining the necessary material, and some support is lent to this explanation by the fact that deliveries began in the third month after official assistance was provided for the Company. Considerable delay was also experienced in prosecuting the extensions consequent on the increased supply contracts, and this may to a large extent be accounted for by the difficulty the Company found in securing the necessary labour and materials, a difficulty due to war conditions and by no means uncommon. As early as February, 1917, the Aircraft Equipment Department urged upon the Controller (Establishment Section) that the Company's works should be controlled with a view of securing labour facilities, and notice was given accordingly of the intention to control the Spondon works on April 23, 1917. For a time the matter dropped, but ultimately on November 13, on the suggestion of the Labour Supply Department, a second notice was

sent, followed by a formal order of control on December 7. With the exception of a section for the manufacture of aspirin, which, we understand, was on a small scale only, and after a time was altogether stopped, all the departments of the Company's factory were arranged in connection with the supply contracts which the Company held from time to time, and from expert evidence given to us it appears that the works were well laid out and properly arranged, and that, so far as the buildings are concerned, they are practically designed and, from comparison with the costs ruling in adjacent localities, not extravagantly constructed.

We are not competent, nor are we called upon, to give any opinion on the quality of the Company's cellulose acetate, though for the purpose of our inquiry we have felt it necessary to consider the views thereon expressed by Government officers. Generally both the Technical and the Inspection Departments give the preference to the product of the Usines du Rhône as being more uniform, though the Chief Officer of the Inspection Department informed us that, whilst in his opinion the material supplied by the Usines du Rhône always gave less trouble in conversion into "dope," it was always possible to make "dope" from the Company's acetate, and he was unable to give to either product the preference in regard to efficiency. We are informed that Companies have also been incorporated during the war in France, Italy, and the United States of America to manufacture cellulose acetate under the Dreyfus process, and that such Companies have been supported by their respective Governments.

#### Attitude of British Chemical Trade

A considerable part of our inquiry related to complaints made in the interest of the British chemical trade that instead of having recourse to British manufacturers, or at least giving them an opportunity of sharing in the supply of the desired British product, the Department favoured foreign chemists, entrusted to them the exclusive supply of cellulose acetate, and disregarded the fact that there were numerous objections taken both to the quality of their product and the great delay in the fulfilment of their promises. At the outset we think it right to observe that such complaints appear to us to be natural under the circumstances.

We have received the statements of the British manufacturers with sympathy and have examined them with care, but it seems to us that at the bottom of the whole question lies the dominant fact that an adequate supply of cellulose acetate for war purposes under new and urgent conditions had at all costs to be assured. The responsibility for the course pursued was at its height when General Alexander took charge in the middle of 1917, and we examined him closely as to his reasons for adopting the course chosen. We feel bound to say that he frankly recognised the weight of the comments made and met them from his own point of view with equal frankness. The matter stood thus:—

Down to the summer of 1917, the Government demand for supplies of cellulose acetate had increased, and the opportunity of satisfying that demand from established sources of supply had diminished. The Company had disappointed the anticipations formed as to the date when it would begin its British manufacture. It was to manufacture, not only with a process of foreign origin, but to a considerable extent for the benefit of foreign interests. The Messrs. Dreyfus themselves, as well as their process, had attracted opposition, and it was quite certain that British chemical manufacturers would claim, and would powerfully support their claim, to be just as capable of manufacturing a commercial cellulose acetate as any foreign chemist, and would expect to have their share of this new trade. To select a moment when the Government programme was to be largely increased as the moment at which to close the door to British enterprise and to invest the Company, in spite of its shortcomings and its connections, with a position so favoured as to amount almost to a monopoly, was a decision of such gravity, and the risks involved were so obvious, that the officials responsible for taking such a course could not possibly shut their eyes to the criticism which they must incur, or fail to weigh the arguments for it very carefully. When those arguments come to be examined they are undoubtedly weighty.

#### Why New Manufacturers were not Employed

Between a general, and even a practical, knowledge of the manufacture of such a chemical product and the experience and

special knowledge which are needed if it is to be turned out in considerable quantities with reasonable uniformity and with a regularity that can be relied upon, there is a considerable difference. That British chemical manufacturers could have overcome the difficulties and have attained the necessary skill and experience in no very long time we need not and do not doubt, but to the time so required there had to be added the further time requisite for equipping the necessary plant on a sufficient scale in the middle of the war. Experience showed that in the case of this kind of plant, as of so many others, that further time would be long. The policy of the Government generally was to discourage the duplication of plant or the erection of anything that was not strictly necessary. The inquiries made by the Department showed that no chemical concern possessed a plant in being which could have been utilised rapidly for the production of any considerable quantity of cellulose acetate, and, although several were confident that they could have reached the manufacturing stage quickly, there was only too much risk that they might be disappointed. Several factories were inspected, and we have taken evidence as to the results of the inspection. The responsible officials came to the conclusion that, if contracts were placed with new manufacturers, there would be much delay in obtaining deliveries, and we are satisfied that they had materials before them from which an opinion might reasonably be formed, nor have we sufficient grounds for holding that opinion to have been wrong. Another point, in respect of which the course pursued by the Department has been open to criticism, is that the Government was made exclusively dependent for its supplies of acetate upon a Company of whose prior production complaints had been made, and that no provision was made for a spare or emergency source of supply of cellulose acetate. This point, again, was too obvious to be overlooked, and in fact it was weighed with care. There had been a great delay and much disappointment connected with the completion of the Company's Spondon works. There had been complaints of the cellulose acetate delivered, and some of it had been rejected. There were officials connected with the Department's Technical Branch whose attitude towards the whole Dreyfus scheme, personnel, process and product was adverse, not to say hostile.

#### Quality of Spondon Product

There is, however, less in all this than might appear at first sight. Since July, 1915, the Government had been more or less committed to the Dreyfus product. Whatever objections had been taken to it when supplied from Switzerland, we were told that the cellulose acetate made at Spondon was favourably reported upon and proved to be satisfactory. In some cases of objections taken, the evidence suggests serious doubt whether they were justified at all. The delays in getting the Spondon factory to work had come to an end, and from the middle of 1917 onwards supplies came forward regularly and in increasing quantities. The works themselves were inspected and reported on as being well designed and laid out, and equipped with all precautions against destructive accidents, and accordingly the risks incident to the decision to draw the whole supply from one place of manufacture were reduced to a minimum. In addition to the objections to erecting fresh works and plant at all, it was by no means clear that persons who had had no manufacturing experience of the process would be able to work it successfully, and extension of the existing works presented advantages as against resort to a new source of supply. No ill effect appears to have resulted from the policy adopted, and we recognise that the situation was one in which some risk had to be faced, however the Department might decide.

Again, it was a natural result of this policy that the concern which succeeded in getting the position of sole supplier of cellulose acetate during the war would in fact obtain a highly favoured position after the war. It received priorities and other assistance, which enabled it to construct a large and well-equipped factory at a time when other chemical manufacturers could not do the like. It gained experience and trained a staff ready, on the return of peace, to take up the manufacture on a commercial scale, and we are given to understand that the future of cellulose acetate is, to say the least of it, promising, for its uses are many and the start thus obtained over other competitors was of real and perhaps of great value. This advantage lends itself readily to a charge of favouritism and, if there were

any ground for believing that the officials who adopted a policy involving such a result were not disinterested or were lacking in good faith, we should feel that they had a very serious case to answer.

#### Adverse View not Accepted

According to our interpretation of our Terms of Reference, we are not for the purpose of this inquiry concerned with mere questions of policy as such, but even in technical matters and in questions of administrative policy mistakes and errors of judgment, if glaring and of great magnitude, may afford evidence which would support suggestions adverse to the integrity of the officials concerned. We have, therefore, considered such questions among the factors involved in the suggestions above-mentioned, and in the result we are unable to accept the adverse view indicated. We have already dealt with the conditions under which the original contract was placed with Dr. Camille Dreyfus by Mr. Turner. Of the subsequent offers to manufacture, the majority did not, in the circumstances, appear to merit very serious attention; but two exceptions may be specifically noticed, namely, those of the United Alkali Company and Courtaulds, Ltd. The first United Alkali Company offer was made to the Admiralty in about May, 1916, in the shape of a tentative proposal to manufacture under the du Rhône process, if a promise of contracts were made. It was communicated by the Admiralty to Mr. Turner; but as the latter had already arranged with Dr. Dreyfus for all requirements of his Department then anticipated, and was given to understand that early deliveries from the Company might be expected, he felt himself unable to guarantee to the United Alkali Company any orders, and left it to the Admiralty to give them such encouragement as it thought fit. The United Alkali Co. was at this time prepared to co-operate with Dr. Dreyfus, but negotiations came to nothing.

A further proposal was made by the United Alkali Company to the Admiralty in October, 1916, in which the Company asked for a minimum guarantee of one hundred tons per annum for five years, subject to "write-off" and depreciation allowances during the war, but the proposals struck Mr. Turner as being so extensive that, if accepted, they would mean the closing down of the Company's works, and the substitution of the United Alkali Co., which was not then manufacturing, had not yet definitely secured the right to use the proposed process, and admitted that it would probably take six to nine months for the erection of the plant. This seems to have been a reasonable view. Subsequent proposals were made by the British Emallite Co. in conjunction with the United Alkali Co. to manufacture under the same process, and these came before General Alexander and were declined, on the ground that investigation was being made into the possibility of making cellulose acetate at a Government factory, and that if the Department decided to adopt this process they would dispense with intermediaries. Lord Weir, who was then Controller of Supplies, was advised accordingly.

The offer of Courtaulds, Ltd., appears to have been invited by an official in the Technical Department, who held strong views as to the unsuitability of the Company's product. The interview between the Technical Officer and the Company's representative took place on October 26, 1917, and on October 29 the latter wrote intimating his Directors' willingness to entertain the matter. On November 5 the papers were passed to General Alexander's immediate subordinate officer, who in a minute dated the following day declined the proposals, in view of the very large increase of plant which would be needed, and of the arrangements already made. In the course of a few days the proposal was referred back through the Chief Officer of the Technical Department and the Director of Aircraft Equipment to the Supply Department, when General Alexander confirmed his subordinate's decision, and remarked on the large amount of capital expenditure, machinery, plant and labour involved, to all of which, unless absolutely essential, the Munitions Works Board took exception. Early in October, 1917, Lord Weir had instructed General Alexander not to consider further extensions without reference to him, and shortly afterwards formal instructions were communicated to Heads of Supply Departments that, in view of the growing difficulty in connection with building, and the supply of labour and materials, and the serious shortage of steel, no further extensions should be undertaken unless vitally urgent in the national interest. This was some months before the proposed deliveries could have been made in any case.

#### "Nothing Amounting to Favouritism"

We are of opinion that nothing amounting to favouritism of the Company has been shown by the Aircraft Department. It is, undoubtedly, the fact, as has been shown above, that from the commencement Dr. Dreyfus, and subsequently the Company, received support and assistance from Government officials, and became, in fact, the sole source to which the Service looked for supplies, but we think that the reasons for this are adequate. In this connection it is worthy of comment that, notwithstanding the transfer of the Aeronautical Department from the War Office to the Ministry of Munitions, and the subsequent change of official personnel, the same policy was adopted, namely, to develop to the utmost capacity the resources of the Company's works.

An allegation was made to us that the Company took employees of the Department into its pay. The authority for this was said to be a statement made by a former employee of the Company, but when the latter attended before us he not only declared that the allegation itself was unfounded, but added that he had never made such a statement to our informant. Whilst the investigations we have caused to be made into the Company's books and accounts give no colour to the allegation, and we have come across no specific evidence in its support, we think it incumbent upon us to call attention to a minute passed at a meeting of the Company's Directors on January 31, 1918, under which a sum of £4,500 per annum, as from January 1, 1918, was voted to each of the Managing Directors, Drs. Camille Dreyfus and Henri Dreyfus, for "living and entertainment expenses," and a sum of £5,000 was voted to the chairman, Colonel Grant Morden, for similar purposes, it being expressly agreed that no detailed account of these expenses need be presented. We have no evidence that these sums were put to any improper use, and only mention the fact lest it might appear to have been overlooked.

As to an allegation made to us that a subordinate supply officer had received from the Company an offer of post-war employment, we would point out that in 1917 a Committee, set up by the Minister of Munitions, found that Dr. Camille Dreyfus, in April, 1917, had offered to employ a subordinate officer in the Aeronautical Inspection Department at an enhanced salary. We have not felt it necessary to make independent inquiry into the facts on which this finding was based, but, having taken it into account, we have carefully considered the above allegation as against the Supply Officer concerned, and have come to the conclusion that the evidence before us does not justify it.

#### Committee's Final Conclusions

In conclusion, we will refer to the criticisms made upon the Company last year, which were the origin of the present inquiry. Whether or not the Sub-Committee on the Ministry of Munitions, which was appointed by the Select Committee on National Expenditure, directed its attention to the supply of cellulose acetate simply in the course of its own investigations, or in consequence of any special representations made to it, we do not know; but, after the publication of the Select Committee's Fifth Report, it is plain that criticism was particularly attracted to the two facts, that the Company had received much official support, including loans of public money, priorities, contracts and an Excess Profits Duty concession on the one hand, and on the other, that its sixpenny shares appeared to be assumed to have become quickly worth £14 10s. each. Hence a connection between these facts was strongly suggested, which alike involved the personal credit of the managers of the Company's affairs and of the Departmental officials concerned. The contrast between the nominal capital of the original Company and that of the Parent Company is indeed so glaring that, for much of the criticism to which they have been exposed, we think that the promoters and others connected with the Company's financial arrangements have only themselves to thank. In other respects, however, less than justice has been done them. If all the facts, which we have sifted with so negative a result, had been available last year to the critics of the Company and its proceedings, we think that their conclusions would, to say the least, have undergone large modification. It is satisfactory to be able to report that, in our opinion, there has been neither favouritism nor corruption, and that the official action taken has been throughout such as appeared to the Departments concerned the best that was open to them under the circumstances.



# Scientific and Industrial Research

## Important Conference of Research Organisations

WE have received from the Department of Scientific and Industrial Research a report of an important conference of Research Organisations held at the Board of Education on July 29. Sir William McCormick (Chairman of the Advisory Council), presided, and the delegates present included: Mr. J. N. Phipps and Mr. R. M. Leonard (representing the British Chocolate, Cocoa, Sugar, Confectionery, and Jam Manufacturers' Research Association); Mr. R. S. Biram, Mr. Jolley, and Mr. C. Wilson (the Glass Research Association Provisional Committee); Mr. J. Bruce Harding and Mr. Walter Dixon (the British Iron Manufacturers' Puddling Research Association); Mr. F. Tomlinson, Mr. Ernest A. Smith, Mr. H. L. Heathcote, and Mr. T. Bolton (the British Non-Ferrous Metals Research Association); Mr. E. W. Houghton, Mr. F. F. Renwick, and Dr. R. E. Slade (the British Photographic Research Association); Mr. H. K. G. Bamber, Mr. S. G. S. Panisset, and Mr. William Gilbert (the British Portland Cement Research Association); Sir William J. Jones and Mr. R. C. Rann (Secretary) (the British Refractories Research Association); Sir Herbert Jackson, Mr. Conrad Beck, and Mr. J. W. Williamson (the British Scientific Instrument Research Association); Mr. William Martineau and Mr. J. W. Macdonald (the British Empire Sugar Research Association); Mr. H. Wippell Gadd (the Drug Club); Mr. F. Banks Warner (the National Fuel Oil Co., Ltd.); Sir T. K. Rose (the Tin and Tungsten Research Board).

### Proposed Records Bureau

The first subject discussed was the establishment of a Records Bureau, which was introduced by Mr. Fleming (British Westinghouse Co.). Many interesting suggestions were offered, and at the close these were dealt with by Sir Frank Heath.

Dealing with the ownership of results obtained by research associations, he said:—

We have declared officially that the ownership in scientific results is that of the members of the association, the association holds that property in trust for its members. Accordingly, the Records Bureau will be organised in two sections—a confidential section and a non-confidential section. We shall ask research organisations, in forwarding us information, to indicate which part of the information they consider confidential and which they do not consider confidential, and any information in the confidential section of the Bureau will be communicated to nobody at all without agreement with the body that sends it. We shall take the utmost care about that. Sometimes, however, this confidential information may be of great value to another research association, and it might be quite easy to negotiate the transference of that information to another association on reasonable terms. The department will then act as the "honest broker" for the transference of this information; but you may absolutely rely upon it that there will be no breach of confidence. The section will be absolutely watertight, and nothing will be used except in consultation with the body or person sending it to us. Our intention, he said, is that the service of the Bureau shall be a national service common to the whole country in so far as the country comes into touch with the department in connection with research. It is at the service of the research associations as an additional service. Beyond any grant we shall make to the association there is no proposal to make any claim on the finances of the research association for running this Bureau. That will be a burden on the fund of the department. The department, fortunately, has an annual vote in Parliament, as well as a million fund, and we hope to be able to persuade the Treasury to allow us to carry the burden of this Bureau upon the vote, and not upon the million fund.

Mr. Heathcote has spoken about the need for getting access to original papers. We must never forget that it is a primary duty of a research association to have its own library and its own records bureau. It is not intended that the central organisation shall relieve the associations from collecting their own information and from having their own library. If we did, we should have an enormous collection of material at the centre which was out of touch with the actual processes of industry. At the same time, anything that the department, through the Records Bureau, can do to help research associations to get a sight of scarce or

rare publications they will do, and they would also, I feel sure, do everything in their power within reasonable limits, as someone else suggested, to get an extract from a document that happened to be in London, and which was needed by an association which had its headquarters at a great distance. But it would never do, I think (at least, I suggest for your consideration that it would not do), for the Bureau to undertake to be merely an agency for sending out extracts of papers on all and sundry subjects. The main burden must be carried by the research association itself, and we must come in to supplement and help, and act as a kind of clearing-house and co-ordinating authority.

The next point was the question of interchange with America. We are already in active intercommunication with the Bureau of Standards, and, so far as published information is concerned, I think you may rely upon the Records Bureau having that information as rapidly as anybody, and we shall be very glad, of course, to give the research association or other workers in connection with the department the fullest information. The question of the rapid intercommunication of knowledge between research associations here and similar associations in America is, I think, a matter which we shall have to be patient about, and which will depend ultimately, as all of us must realise, upon the measure of economic competition that is likely to arise in the future between the two countries. If we can break down the suspicion between firms in an industry in our own country we shall have gone a very long way. It will be the duty of the Bureau rather to draw attention to original sources of information than to send *résumés*.

### Conditions of Employment of Research Workers

Alderman Hinchcliffe (Woolen and Worsted Research Association), in introducing this subject, said that the success of their endeavours in the different fields of research would depend very largely on the generosity and fairness of their agreements with research workers. One principle he would lay down was that the research worker should be absolutely free from financial worries, otherwise he could never give his mind to his work.

Sir Frank Heath, on the subject of rewarding research work, read an interesting opinion from the director of the research laboratory of one of the largest engineering works in this country. "The payment," the writer said, "to people of special amounts on account of successful work creates the worst spirit on a research staff. Firstly, a successful result is hardly ever the work of a single man. It nearly always arises as the result of conversations with and suggestions from others. One has known cases where the research man has received all the essence of an idea from a workman, and one can recall few cases in which much help has not come from colleagues or the director himself. The bestowal of special grants is liable to cause ill-feeling, and tends to invite secrecy and exclusiveness. Secondly, the director is responsible for assessing pieces of work of different individuals, and it puts him in an unfair position when he has to give a man a piece of work which in the nature of things cannot lead to any thing for which a special grant could be obtained. I suggest that general individual merit should be rewarded by salary increases, and that successful research work should be rewarded, if thought desirable, by a grant to be divided amongst all members of the research staff, whether they have participated in the successful research or no. The majority of the work done in a laboratory can be published, and every encouragement should be given to men to prepare papers for publication. When it is undesirable to publish the results of research there is usually no difficulty in giving an account of the research. It is right, however, that all publications by the staff should be supervised." Finally, the writer condemned the view that the ultimate aim of industrial research is mainly financial profit:—"The main object of industrial research is to build up a strong and progressive industry."

Mr. Greenwood (Cotton Research Association) said that with regard to the points about paying special bonuses for research, the writer was perfectly right, because, he added, there is great difficulty in deciding who really has found out or should have the real credit of any particular invention or discovery. It may be that a good many people contributed to that particular discovery, and it would be very unfair if one man were to be given a bonus

with regard to it. Further, if research workers were to know that they would be paid for their services in a great measure by a bonus dependent on the success of their efforts with regard to discoveries, it would militate against getting the very best work from them, because there must be some research surely which may for a long time result in no discoveries of vital importance at all. In fact, it may be that the very greatest discoveries may be made after a certain number of men have laboured in vain, and then, greatly as the result of their labours, someone else will come out on top of them and take advantage of their discoveries, and it would be very unfair indeed, I think, if they were to reap the reward. We find in industry, too, that where a man is working for a bonus as against a salary, it very often means that he loses that real interest in his firm and in his industry that he ought to have, he is so self-centred in the idea of how his efforts will affect the reward he receives.

Sir George Beilby (Director of Fuel Research): I agree substantially with what has been said in the letter. It is a very difficult and dangerous thing to begin apportioning the special share of credit to each member of a research staff that is to be recognised by a money payment. I have had practical experience of the difficulty which arises from this. My own practice has always been rather to give all the able men who are doing their best to improve the manufacture that they are interested in an interest in the whole of the profits—in the actual results. They then feel that they are recognised, that they are taking their part, and that part is not being lost sight of. If you give special prizes, or even special bonuses, on actual savings made in a given process, I have found that to be dangerous, because the man immediately becomes narrowminded, and he thinks of nothing but making his particular department successful and showing how much is saved.

Sir H. Jackson (Scientific Instrument Research Association): May I, as a director, say that when the idea of some kind of bonus being given to research workers came before me, I viewed it with consternation. I think it would be impossible for a director to carry out his work under those circumstances. I have already started a scheme which I hope will be most helpful. On any research being done by any one man we, all meet together and discuss it, so that each man who has a little bit of knowledge can add it for the benefit of the one who is carrying it out. It would be a nightmare to the director if he were to give a bonus to one man. The only way is to remember that when you get a good man you should pay him well, and when you have got your good man, give him a feeling of security of tenure by increasing his salary.

#### The Position of Inventors

Sir Frank Heath: There is one point upon which we should very much value an expression of opinion, and that is in connection with the treatment of results which are obtained. It has been suggested to the department rather strongly from one quarter that, supposing a discovery is made by a worker under a research association, and the discoverer thinks that it ought to be patented, and the association disagrees with him, and says, "Well, we are not specially interested in this, and we are not going to secure this by a patent," it ought to be open to the discoverer to go and patent that discovery himself, and to take any benefits that might result from such patent.

Colonel O'Gorman (Adhesives Committee of Conjoint Board of Scientific Societies): Broadly speaking, I do not think firms attempt to touch the inventions of their workmen. The workman comes in without agreement, and is free to protect what he likes against the firm, in his own interest, to sell it to outside people, and with a week's notice to transfer himself and his invention to new people who are prepared to exploit him. That is the free position in which the workman of a firm mostly is. Designers and draughtsmen, the higher skilled men, are, on the other hand, generally bound by agreement to assign their devices and inventions to the firm, and it is left to the generosity of the firm to reward them. That is a perfectly good arrangement, because the firm has considerable inducements to reward them.

Sir William McCormick: I think we all agreed that we cannot come to an absolute solution of this problem to-day. It occurred to me that we must, in order to get this fully discussed, get the scientific men here to discuss it, too—members of the chemical societies. I should like very much to have an equal number of scientific men here, Fellows of the Royal Society, the Chemical Society, and others.

Mr. Bolton (Lighter Metals Research Association): I should like to know whether you will draw up a standard form of

agreement, or whether each association is at liberty to enter into its own agreement.

Sir Frank Heath: We are not quite rash enough to attempt anything in the form of a standard agreement. I consider it quite possible that the practice in different associations may vary very considerably. Alderman Hinchcliffe, for instance, is thinking of an industry in which economical inventions by the operatives form an important factor in the progress of the industry, where practically the whole advance is carried out by keen men of science. When you have industries which are so different as that, it is probable that their practice will be reflected to some extent in their agreements, so that we can only move cautiously.

Mr. Prentice (Diesel Oil Engine Users): I think the true inventor does not carry out his research for monetary reward. Where these research associations can help him is not in giving him pecuniary remuneration for his work, but allowing him and enabling him to put his ideas into a practical form.

Colonel O'Gorman afterwards introduced a discussion on "Co-operation among Research Associations for the study of accessory materials or equipment"; and the conference closed with a vote of thanks to Sir Frank Heath for convening the meeting.

### James Watt Centenary, 1819-1919

To the Editor of THE CHEMICAL AGE.

SIR,—One hundred years have elapsed since the close of James Watt's life. The Commemoration to be held in Birmingham on September 16, 17 and 18, should provide a gathering of engineers such as the world has never seen. It is intended that an international permanent memorial should be founded in Birmingham, where James Watt spent the greater part of his life and built all his engines, so that the city should be to engineers what Stratford-on-Avon is to lovers of Shakespeare, and Mecca to the followers of Mahomet. Your readers will realise that a large sum will be required to establish and endow the proposed memorial. Amongst the promises already received may be mentioned £1,000 from the Birmingham Small Arms Co., Ltd. The Committee are considering the best method of keeping subscribers informed of the progress of research carried out under the ægis of the James Watt Professor of Engineering. Success is assured if those interested will subscribe all they feel they owe to the genius of James Watt.—We are, etc.,

W. MILLS, Chairman.

R. B. ASKQUITH ELLIS, Hon. Sec.

Chamber of Commerce Building,  
New Street, Birmingham.

### Recovery of Used Lubricating Oil

To the Editor of THE CHEMICAL AGE

SIR,—The letter of your correspondent M.T., appearing in your issue of July 12, under the above heading, evidently written with inside knowledge, comes to us as an unsolicited testimonial. The process that he mentions was worked out by us in pre-war days, and for commercial purposes. At the period of the war however, when the shortage of oil threatened to be serious, it was adopted by Lieut.-Col. Stanley Smith, assistant controller of Salvage, War Office, for treating many thousands of gallons of waste oil from the various services and rendering it suitable for use in the Mechanical Transport Section. To-day it again assumes commercial, one might almost say, national importance, for oil is much more expensive than it was in pre-war days. It is almost wholly of foreign origin, necessitating large payments abroad and the use of considerable shipping for transport. We shall therefore, be pleased to get into touch with any large users or collectors of oil to whom the process may be of interest.—Yours, etc.,

ALEXANDER DUCKHAM & Co., LTD.

4, Broad Street Place, E.C. 2.

### Bonus Systems in Chemical Works

To the Editor of THE CHEMICAL AGE

SIR,—I was much interested in Mr. Swindin's article in your last issue, and agree that the bonus system, or an extra payment by results, in a chemical works is not only an incentive to production, but also increases the quality of production and economises the use of raw material.

Some years ago in a Midland works, labour (now all union) received a weekly living wage which was increased by bonuses,

in all departments connected with the manufacture of chemicals, controlled from the results obtained in the laboratory. Burner men gained or lost on furnace work, gauged by available sulphur left in ore residues, as well as nitre saved in the potting oven. Chamber men gained on the nitre saved, and also had a bonus on the chamber or chimney exit. Saltcake and furnace men received recognition on the output from the hydrochloric acid plant, and so on.

In this way all employees were given an interest in their work, and last, but not least, the products of manufacture and yield were seldom complained of. Of a necessity it put heavy work on testers in the laboratory daily or weekly, as the case might be, but even this was recognised by the management in a beneficial manner each full year. By recognition the staff and employees became old servants, and we all worked amicably together, and the products of manufacture commanded their own price for commercial quality on the markets.—Yours, &c.,

H. D.

## Germany's Chemical Enterprise

### The "Discoveries" of an American Inspector

DR. E. C. WORDEN, the explosives chemical expert of the United States Bureau of Aircraft Production, Washington, has just returned to London after a tour of inspection of the chemical works in Germany. In a statement to the *Times* he gives a distinctly favourable impression of the state of the German chemical industry.

"Speaking generally," he said, "the chemical industry of Germany is, and has been since the Armistice, just as prepared for peace operations as though war had never interfered with it. The technical staffs of the great concerns are at their maximum numbers. The skilled workers seem as numerous as ever. If these men were engaged on war work it was either as clerical workers or as assistants of Government undertakings. They certainly never saw the trenches. The dye and pharmaceutical industries are in as strong a position as ever, if not a stronger. But the greatest achievement of the Germans lies in their working of a process for the successful fixation of nitrogen on a great commercial scale. The headquarters of this new industry is the Haber plant of the Badische Anilin and Soda Fabrik at Oppau, near Ludwigshafen, on the Rhine, to which the German Government since the Armistice has lent nearly 200 million marks.

"Begun since the Armistice, built with reinforced concrete, this factory has now between 8,000 and 9,000 actively employed. When completed it will have a storage capacity of 350,000 tons of ammonium ready to be turned into ammonium salts and a daily capacity of 2,800 tons, an amount sufficient, with potash and phosphates, to give an abundance of fertilizers for all German agricultural purposes. This building is only one of seven now in course of construction, and its one storage shed is equal in area to the whole of St. Pancras Railway Station. A few months ago the site was an ordinary marsh, but to-day the building contains such an intricate piece of plant as I have never before seen in all my experience. Up to the present about £150,000 have been expended upon it. The machinery is automatic throughout, the plant is practically duplicated in every part, there are four tracks between each set of buildings, and each building contains overhead automatic conveyances, while there are 3,500 telephones at work efficiently. Moreover, there is not the slightest trace of any odour of ammonia, which proves that in the manufacture of nitrogen there can be practically no loss. The success of the method employed—without going into any technical details—is due to the exceptional conservation of heat, the adoption of automatic calorimetric instruments throughout, and an extensive knowledge of critical temperatures and pressures in the most important stages.

"But if Germany has secured a great success from an agricultural point of view, it must be remembered that she has achieved even more at the same time. Nitrogen is the central factor of all modern explosives. Not merely will the Germans henceforth be enabled to manufacture it on an unlimited scale for fertilizing purposes, but, almost at a moment's notice, they will be in a position to utilize it for the manufacture of munitions on an enormous scale. Moreover, under the present process, their consumption of electrical energy per pound of nitrogen is very low."

Dr. Worden proceeded to give instances of German readiness as regards the chemical industries to enter the fields of international competition. "To take one example," he said, "the Bayer Company of Leverkusen on the Rhine, near Cologne, has substantially 3,000 tons of dye stuffs, chemicals, and pharmaceutical products ready for export now, either as finished products or in hand or in process." In all these factories, the employees are working in two shifts of 12 hours each. Apparently there is no difficulty either in regard to working hours or the amount of production. "I fear," he said, "that both Great Britain and the United States will find themselves faced with very severe competition from Germany in the chemical industries in years to come. The Germans have in their favour a general standard of fairly high education. In our countries we have a considerable number of exceedingly brilliant men; but we have also a vast majority of sub-normals as regards both education and intelligence. Moreover, the policy of the Government during the war and since the Armistice is to advance sufficient sums to industry to compensate for their lack of raw materials—the present great weakness of the manufacturers—until their normal productive capacity is resumed. At the present time their settled project is to manufacture the articles whereof other countries are most in need, and whereon the highest net profit can be realised."

## The Industrial League

### Labour Leaders' Demand for larger output

THE first summer convention of employers and employed in connection with the Industrial League was held at Birmingham last week. The aim of the League is "to bring employer and employed together in an atmosphere conducive to a calm and fruitful discussion of industrial problems in which they are mutually concerned."

In his presidential address, Mr. G. H. Roberts, M.P., said: We are going to purge our movement and our industrial organisation of those who are constantly dropping corrosive poison, who label it, of course, in fantastic and alluring fashion "Internationalism" or "Universal Brotherhood." Love everybody in every other part of the world, but hate your own people is a hellish doctrine, and one that ought to be squelched. He was sure that more substantial results ensued from friendly negotiations, from open deliberation, than could ever follow from wild upheaval and protracted strikes. He was convinced that they could stimulate output in this country without in any way adding to the burdens of the workers. The only requisites were friendly understanding and co-operation. The difficulties before them could only be overcome by work, by output, by the restoration of credit, by being able to bring back the British sovereign to something like its pre-war value. The position of the country was too perilous and they could not afford what some people lightly talked of as a social revolution. But he had faith in the people. If he had not, he would say that national bankruptcy inevitably awaited them. At last many British Labour men were taking their stand against doctrines of Anarchy. All patriotic Labour people should determine that the extremists should be cleared out of their organisation.

### Mr. Clynes on Under-Production

MR. J. R. CLYNES, M.P., in an address on the relation of labour to industry, said that the sooner both employers and employed recognise that they should jointly exploit industry for the benefit not of one side, but of both sides, the better it will be for both. We cannot hope, he said, to keep our place in the markets of the world as a great manufacturing and exporting country by encouraging any system of under-production. Production may for the time being suffer some curtailment by reduced hours of labour, but output ought not to be lessened by any other means, and output can be greatly increased by improved systems of production, reorganisation, the use of the best appliances, good time-keeping, and the removal of any old-time method which might have hindered production in the past. Employers, however, must not make the mistake of thinking that workmen will agree to produce more unless they can enjoy a greater share of what they produce. In other words, increased output must mean not only increased commercial prosperity, or increased profits. It must mean an increased standard of social life for the worker, with higher wages, and, therefore, a greater purchasing-power to buy and consume more of the goods resulting from labour.



The workers can make no more grave mistake than to encourage under-production. Scarcity of commodities is the opportunity of the profiteer. Scarcity may cause some little inconvenience to the rich, but it can cause real and continued privation to the masses of people whose purchasing power is limited. Some forms of profiteering can be punished by the law, but workmen who deliberately restrict output, or who fail to accept any form of industrial development which can make their labour more productive, are punishing themselves and their class without knowing it. If profiteering is conscious pilfering, cannery is an ignorant act which deprives many people of their real needs. It inflicts no loss upon the favoured class, which, wherever it is practised, it may be designed to punish. It is a sentence passed upon the innocent by those who may not know they are guilty of a wrong.

When the workers were unorganised, and could have little say in fixing labour conditions and pay, over-production sometimes produced an artificial state of trade depression and unemployment. We have outlived that possibility, and we should outlive speedily the heresy which a few appear ready to foster, that lessened production means greater assurance of work for other people. On the contrary, it means the greater prospect of unemployment. It impedes our recovery from the industrial dislocation which the war inevitably caused. It keeps up prices, and lowers nothing but the workman's standard of existence. It is in the highest degree harmful to the general public interest, but in a special degree under-production is the enemy of the masses, whose pressing needs require a more abundant supply of all forms of materials for house-building, for food-production, the manufacture of every kind of house requisite, clothing, and the common daily needs of existence.

### Loss on State Food Production

#### Chemicals and Fertilisers

ACCORDING to the official account issued this week the loss for the year on the principal trading schemes carried out by the Food Production Department was £1,080,529, the greater part of which was due to the motor-tractor ploughing service.

In connection with land cultivation, fertilizers were supplied by the Government, sometimes at a loss and sometimes at a gain. The principal loss was on superphosphate. The report states that this transaction was undertaken early in 1917, when there was a serious shortage of superphosphate, which was urgently required for immediate application to the crops. It was recognised at the time that a loss on the transaction was unavoidable, as the current price in this country, based on the cost of phosphate rock imported under old contracts in the previous year, was considerably below the price then ruling abroad after allowing for freight. It was considered inexpedient to offer superphosphate for sale merely to the highest bidder, owing to the risk of its being held for a rise until the following season, and the object of the department being thereby defeated. It was therefore offered to groups of merchants at a price which allowed of its being sold to farmers at the current market price. The net loss of £28,759 was, however, considerably heavier than had been anticipated, owing to rates of freight being finally fixed by the Ministry of Shipping at a much higher figure than was originally allowed for.

The Government's activities in regard to knapsack potato sprayers and chemicals, fruit-preserving bottles, and fruit canning are referred to in the following notes:—

**Knapsack Potato Sprayers and Chemicals.**—The direct sale of sprayers and chemicals for the spraying of the 1917 potato crop was undertaken by the Department owing to the insufficiency of the time in which to organise the distribution through the trade. The loss was chiefly due to the sale at the end of the season of surplus chemicals. Machines and chemicals used for demonstration purposes are also charged against the account.

**Fruit-Preserving Bottles.**—The selling price was fixed on quotations obtained through the Ministry of Munitions. In the case of one or two contractors, these proved to be slightly under the final prices paid. The account includes also the cost of bottles used for demonstration purposes.

**Fruit Canning.**—As in the case of the sale of fruit-preserving bottles, the object of the Department in undertaking canning operations was to popularise methods of fruit conservation with which the public was, generally speaking, unfamiliar, and to make available for human consumption quantities of the plentiful fruit supply of 1917, which might otherwise have been wasted.

Besides the actual sale of home canners and tins, three experimental canning stations were opened to test the possibilities of canning on a commercial scale at a total net cost of £1,441. The account is also charged with the cost of fitting up a kitchen and materials used for demonstration purposes.

The following figures are taken from the abstract of accounts:—

|   | Purchase Price. | Sales in hand. | Stocks. | Loss. | Profit. |
|---|-----------------|----------------|---------|-------|---------|
|   | £               | £              | £       | £     | £       |
| Superphosphate..                          | 91,942          | 63,183         | 28,759  | —     | —       |
| Nitrate of Soda ..                        | 69,363          | 69,363         | —       | —     | —       |
| Knapsack potato sprayers and chemicals .. | 66,690          | 64,822         | 1,868   | —     | —       |
| Fruit preserving bottles..                | 29,253          | 28,736         | 517     | —     | —       |
| Fruit canning ..                          | 23,497          | 20,211         | 3,286   | —     | —       |
| Basic slag ..                             | 143             | 193            | —       | —     | 50      |
| Muriate of potash ..                      | 15,421          | 19,437         | —       | —     | 4,016   |
| Totals ..                                 | 296,309         | 265,945        | 34,430  | —     | 4,066   |
| Net loss, £30,364.                        |                 |                |         |       |         |

### Manufacture of Fermentation Glycerin

#### German Activities during the War

THE investigations initiated by Lüdecke with the object of obtaining glycerin on an industrial scale by means of the fermentation of sugar assumed supreme importance in Germany after the outbreak of war, when the supplies of fat became enormously curtailed as a result of the imposition of the blockade. The extension of these researches and the conversion of the results obtained into the practical process of Connstein and Lüdecke were kept a close secret during the war, but were recently made known by Connstein at a meeting of the German Chemical Society, a report of which has appeared in the *Wochenschrift für Brauerei* (May 10, 1919).

The process is based on the observation that the percentage of glycerin formed from sugar is increased if the fermentation is allowed to proceed in presence of alkaline substances. Among the latter a special position is occupied by sodium sulphite, which yeast is able to withstand in very large proportions. Thus, a solution prepared from 10 litres of water, 1 kilo. of sugar, and 400 grams of the sulphite, together with ammonium sulphate, sodium phosphate and potassium salts, is completely fermented in a few days by 100 grams of yeast.

The process was worked by the Protol Company, and as many as sixty-three factories were at first pressed into the service, although only the few largest were finally retained, the monthly output of glycerin being about 1,000 tons. Very serious practical and administrative difficulties were encountered at the outset, but these were ultimately overcome, and it was found possible to obtain 20 parts of purified glycerin, 27 parts of alcohol, and 3 parts of aldehyde from 100 parts of sugar. After removal of the yeast by filtration and of the alcohol and aldehyde by distillation, the bulk of the salts present are precipitated by calcium chloride and then by sodium carbonate, the liquid being afterwards neutralised with hydrochloric acid and filtered from the sludge formed; concentration and subsequent distillation yield a glycerin suitable for all technical purposes. As is the case with soap-works glycerin, the distillation of fermentation glycerin is sometimes complicated by the presence of trimethyleneglycol.

Neither the race of yeast, nor the nature of the sugar, nor the temperature prevailing during fermentation influences the yield of glycerin; raw sugar or even molasses is utilisable. At the termination of the fermentation the yeast exhibits certain changes in its morphological character, but still retains its fermentative capabilities; the worts used are, however, fatal to lactic and acetic bacteria.

With increase in the amount of sodium sulphite employed, the proportions of glycerol and aldehyde produced gradually increase, whilst those of alcohol and carbon dioxide continuously diminish; this is illustrated by the following experimental figures:—

|                             |      |      |      |
|-----------------------------|------|------|------|
| Sulphite employed .....     | 25   | 50   | 100  |
| Glycerin formed .....       | 11.3 | 10.6 | 27.1 |
| Alcohol formed .....        | 40   | 28.7 | 23.3 |
| Aldehyde formed .....       | 2.4  | 5.8  | 8.6  |
| Carbon dioxide formed ..... | 37.6 | 35.8 | 29.4 |

No information is available as to the cost of fermentation glycerin, and its economic manufacture in normal times would naturally depend on such questions as prices, supply of fats, &c.—*J.S.C.I.*, August 15.

### Sources of Power

CONTINUING his articles in the *Observer* on "Sources of Power," Sir Oliver Lodge discourses almost as entertainingly as Grant Allen might have done on the locked-up energy of the atom.

A pinch of coal dust, or a thimbleful of oil, he writes, represents at present the most portable form of power. If the whole of the energy resulting from these, when combining with oxygen, could be really utilised, they would yield quite a considerable store. An ounce of oil completely burnt generates, say, 1,200 British Thermal units, or would heat between 6 and 7 lb. of water from freezing to boiling point; which, interpreted in mechanical power, is the equivalent of 410 foot-tons. A ton falling a height of 410 feet would generate the same amount of heat. An ounce of coal completely burnt would yield slightly less energy, about four-fifths of this amount. The calorific value of different hydrocarbons does not differ extensively, when reckoned by weight. But by no mechanism is it possible to utilise mechanically more than a small fraction of the heat energy generated by any form of ordinary quick combustion. Slow combination, as in an electric battery, might be tractable throughout; but once the energy of combustion has taken the random form of heat, a great deal of it has escaped control, and only a small percentage can be directed along desired channels; that is, only a fraction is available or useful. Still, there is a fraction which we do know how to get at and utilise: a knowledge which we owe, in any perfection and on a large scale, specially to the genius of James Watt. A spoonful of nitro-glycerine, again, represents a considerable store of energy, though of a rather violent and intractable kind. The laws regulating all this chemical molecular sort of energy are understood.

But is there any kind of energy locked up not in the molecule, nor in the interaction between molecules, but in the actual structure of each atom? Does a single atom of matter contain energy by reason of its very constitution? And if so, is there any means of getting at it?

People sometimes speak of radium as if it were unique. Not so: it is a striking member of a class, and it serves well to illustrate the properties of that class. Every now and then, an atom of radium explodes or fires off a projectile—what is called an  $\alpha$  particle. The projectile bears to the residue of the atom something of the same proportion that a shot bears to a gun. It is 4-225, or, say, 1.50th of the whole—like a 2-ton gun firing a 100lb. shot. Only now and then does a radium atom get to this explosive stage. For every one that thus exerts itself, in the course of a year, there are about 3,000 which remain quiescent for that period. But directly one shot has been fired, the rest of that particular atom is remarkably unstable, and does not settle down into quiescence again till it has fired off four more, converting itself each time into a different element.

To get some notion of the speed we may compare it with the highest speed of a bullet. During the time taken by a rifle bullet to fly without resistance from the muzzle of a rifle to a target 300 yards away, the  $\alpha$  particle simultaneously shot off from radium, if it met with no obstruction, would have travelled the 3,000 miles from London to New York. The time needed is only a quarter of a second. And as to the energy of such a projectile—it is not much in itself, because its mass is so minute, but weight for weight it is four hundred million times more energetic than a bullet.

Chemical combination is "not in it" with energies such as this. And this is the kind of energy which is locked up, and at present inaccessible, in every atom of matter. A little arithmetic would enable us to paraphrase the late Sir William Crookes and say that if all the energy in an ounce of matter could be extracted and fully utilised it would be enough to lift the German Navy and pile it on the top of Ben Nevis.

### Annual Report on Explosives

THE forty-third annual report of H.M. Inspectors of Explosives dealing with the year 1918 [Cd. 278, price 3d.], states that during the past year, and for the whole period of the war, the inspectors had been called upon almost daily to strike a balance between safety and output, and to suggest means for securing the one without unduly diminishing the other. In spite of all precautions, it was, unfortunately, impossible entirely to avoid accident, but, having regard to the number of persons employed, and to the lack of previous experience, not only of the majority of the

workers, but also of many of the overlookers, foremen, and managers, the figures with regard to accidents are to be regarded as satisfactory.

The report goes on:—"Now that hostilities are over it is hoped that the number of accidents will revert to the normal, but we will take this opportunity of directing the attention of manufacturers to the special risks attached to the breaking up of ammunition of all kinds, a class of work which will, no doubt, be required for some considerable time, and which has been shown by experience to be, as a rule, more dangerous than actual manufacture. Every precaution should, therefore, be taken in regard to screening and other special protective measures, and the number of persons in any one risk should, now that no particular emergency exists, be reduced to the lowest possible limit."

Eight new factories have been licensed during the year, making a total of 73 added since the outbreak of war. The total at the end of the year was 183. The total number of visits paid by inspectors during the year was 497, as compared with 469 the previous year. The results on the whole were highly satisfactory.

The number of accidents under the heading "Use and Miscellaneous" was 253, as compared with 293 in 1917. By these accidents 27 persons were killed and 256 injured, as compared with 40 and 309 in 1917. Detonators were responsible for 27 accidents, 13 of which were due to playing with these dangerous articles.

The number of accidents causing death or injury from August 4, 1914, to November 11, 1918, was 733, and those not causing death and injury 544, a total of 1,277. The number of persons killed was 325, and the injured numbered 1,316. The killed included 54 women.

The report points out that, although at the first glance the loss of 325 lives and injuries to 1,316 workers might seem unduly large, yet when these figures were distributed over four-and-a-quarter years the net result worked out at 76.5 persons killed and 310 injured a year, or, taking the average number of workers employed, only 1.25 persons killed and five injured per 1,000 per year.

### Germany's Nitrogen Industry

ON the initiative of the German Government, a syndicate of nitrogen manufacturers has been organized to develop new markets. Germany is now able to produce 500,000 tons of nitrogen annually, while its domestic consumption is estimated at 225,000 tons, thus leaving an enormous quantity available for export. Before the war, Germany imported from Chile each year, 750,000 tons of saltpetre, representing 115,000 tons of nitrogen. The collapse of such a trade will be felt in the ocean freights of the world.

The trust is composed of the three large groups producing artificial nitrogen—the Baden Aniline and Soda Works of Ludwigshafen, who also control the plants at Oppau and Merseburg; the German Association for the Sale of Ammonia at Bochum, including the Upper Silesian Coke Works and the Chemical Factories Stock Co., as well as the Economic Association of Gas Works; and the Bavarian Nitrogen Works. The German Government is represented on the board of directors and on the management. The principal directors are Dr. Brueckner, representing the Government; Dr. Bueb, representing the Baden Aniline and Soda Works; Director Sohn, representing the German Association for the Sale of Ammonia, and Dr. Caro, representing the Bavarian concern.

THE SCOTTISH SPITZBERGEN SYNDICATE LTD., state that news of an important discovery of coal has been received from Dr. W. S. Bruce, the leader of the syndicate's expedition which sailed on July 15 from Leith for Spitzbergen.

IT WAS OFFICIALLY ANNOUNCED on Wednesday at Glasgow that the Anglo-Persian Oil Company, Ltd., have intimated to the directors of the Scottish oil companies that as all but a small proportion of the shareholders have accepted they are prepared to implement the terms of their offer of July 11, and that the necessary steps are being taken to register the new company to be formed to acquire the shares of the various companies. The offer of the Anglo-Persian Company (in which the British Government has a controlling interest) was to purchase the Ordinary shares of the Scottish oil companies.

### The Nitrate Industry of Chile

THE position of the nitrate industry continues to be precarious, and there would appear to be no prospect of any recovery for many months to come. *The Board of Trade Journal* states, that exports are practically nil and stocks are mounting up, and it is difficult to understand the reason why so many factories, as there are, continue to produce. Although a large number of factories have stopped working and others are only producing half their capacity, yet production monthly amounts to some 3,000,000 quintals. (22.087 quintals go to the English ton.) Exports which amounted in normal times to 45-50,000,00 quintals, rose to over 60,000,000 quintals during the war.

Stocks on the Coast, on May 31, last, amounted to 31,000,000 quintals, and adding thereto the probable production of June, and allowing for small amount exported, they total some 34,000,000 quintals at end of June. If the present monthly production is continued, by the end of the year there will be somewhere near 50,000,000 quintals on the Coast, as there does not appear to be much likelihood of freights being available even if demand increased. Thus at the end of the year, unless many more factories close down, there will be stocks sufficient to supply 1 to 1½ years' normal demand. Under the circumstances it is to be presumed that most of the factories now working will have to close down before long.

This position has had the natural effect of bringing about a very serious crisis—merchants refusing to take delivery of orders under any small pretext whatsoever. With the new Chilean Customs law, which compels merchandise in bond to be despatched within a certain limited time, under penalty of the merchandise being put up to public auction if it is not done, the banks are being compelled, in the interests of their clients, to despatch and warehouse the goods, otherwise the same merchants who have refused, the goods would probably buy them through others at cheaper prices.

### Research in Non-Ferrous Metals

THE British Non-Ferrous Metals Research Association is being instituted and organised to act as a medium for securing the fullest possible benefits from scientific and industrial research and information which are essential for the present and future progress of all industries concerned in the production, treatment, manufacture, and use of non-ferrous metals. The association will have the support of the Government Department of Scientific and Industrial Research, which has a special fund set aside for the financial aid of associations such as the one now in process of formation. It is stated that the association will encourage and develop technical efficiency in the production, treatment and utilisation of non-ferrous metals and alloys, by the promotion and application of scientific and industrial research, and also institute an information bureau of all important technical and scientific information directly or indirectly relative to the non-ferrous metals industries of the British Empire. A provisional committee of the proposed association is now at work, and is chiefly composed of members who have been appointed as representatives of the various existing trade associations. The memorandum and articles of association will provide for the establishment of a research institute and experimental workshop; but full advantage will be taken of existing institutions. It is intended at an early date to obtain suitable quarters for housing an information bureau, to appoint a staff, and to establish branches in various centres of the country. This bureau will be a storehouse of tabulated scientific and technical information collected from all available sources and arranged in such a form as to be of easy access and practical utility to meet the everyday wants of those engaged in the production, treatment, working, and use of non-ferrous metals. Any further information and particulars will be supplied on application to the secretary, Provisional Committee, British Non-Ferrous Metals Research Association, 30, Paradise Street, Birmingham.

### Canadian Fertilisers and Crop Production

THE Canadian Government are taking steps to spread information as to the nature and use of Canadian fertilisers and the most up-to-date methods of crop production, and the fertiliser

industry itself has set up a bureau, the purpose of which is to disseminate information which will lead to the increase of crops and the improvement of their quality, to encourage farmers to devote greater attention to soil drainage, crop rotation, the use of lime, the selection of seed, and the careful application of fertilisers. Many carriers of potash are now being successfully developed. The seaweed of the Pacific, the rocks of Western States, the briny waters of inland seas, have given immense yields. Canada has to import phosphoric acid from the South-Eastern and Western States. The country's resources in mineral ores ensure a supply of sulphuric acid; and the meat production in the Dominions provides great quantities of bones. The water power and limestone deposits guarantee supplies of synthetic ammonia. Potash discoveries in the Western Provinces hold out great promise of production. The industry has six factories in Ontario, four in Quebec, and four in the Maritime Provinces.

### Chemical Factories in South Africa

ACCORDING to statistical reports there were seventy-seven chemical factories in the Union of South Africa in 1915-16 and ninety in 1916-17, distributed over the four divisions as follows:

|                         | 1915 | 1916 |
|-------------------------|------|------|
|                         | -16  | -17  |
| Cape Colony .....       | 31   | 37   |
| Transvaal .....         | 26   | 31   |
| Natal .....             | 20   | 21   |
| Orange Free State ..... |      | 1    |

The total capital invested amounted in 1915-16 to £5,914,000, of which the share of Cape Colony was £1,671,372; Transvaal, £2,141,857, and Natal, £2,101,770. The total value of articles produced in the chemical industry was £4,289,980, of which £1,245,186 came from Cape Colony; £1,186,717 from Transvaal, and £1,858,086 from Natal. In all there were employed 6,918 workmen: 1,870 in Cape Colony; 1,725 in Transvaal, and 3,313 in Natal. These received in wages the total of £531,739, distributed as follows: £176,854 in Cape Colony; £165,160 in Transvaal, and £209,725 in Natal. There is, according to the census report of 1916-17, but one chemical factory in the Orange Free State. Natal, on the other hand, heads the list as regards number of factories, employees and value of products, which is probably due to the influence of Kynoch's factory for explosives.

### U.S. Chemical and Dye Exports

THE total dyes and dyestuffs exported from the United States of America during May showed a decrease as compared with the exports during May last year, the value being 954,943 dollars, as compared with 1,278,578 dollars, according to figures issued by the Bureau of Foreign and Domestic Commerce. During the eleven month period ending with May, exports had a value of 16,473,019 dollars as compared with 15,244,771 dollars exported during May last year and 10,249,241 dollars exported during the same period the year before. Aniline dyes exported during May were valued at 585,970 dollars as compared with exports of 626,204 dollars during May last year. During the eleven month period ending with May, exports were valued at 9,325,287 dollars as compared with 6,469,497 dollars during the same period last year. Total chemicals, drugs, dyes, and medicines exported during May were valued at 9,732,617 dollars, as compared with 13,086,270 dollars. During the eleven month period ending with May, exports were valued at 135,785,933 dollars as compared with 165,365,629 dollars exported during the same period last year, and 168,786,802 dollars during the same period the year before.

### Obituary

DR. LOVELL DRAGE.—Dr. Lovell Drage, of Hatfield, who died on Thursday week, was the author of "Chemical Treatment of Cancer" and other medical works. Among the appointments held by him were those of house-surgeon at St. Bartholomew's Hospital, medical officer of health for the Hatfield Rural District, and coroner for Mid-Herts.



## From Week to Week

DAMAGE ESTIMATED AT £30,000 was caused by a fire which broke out at Cox's Glue Works, Edinburgh, on Monday.

SIR BOVERTON REDWOOD, Bart., the well-known petroleum expert of Bishopsgate, London, E.C., chairman of the Gas Traction Committee, who died on June 4, has left estate valued at £165,013.

SWANSEA HARBOUR TRADE RETURNS for June show a decrease in imports of zinc ore and alloys, sulphur ore, pyrites, &c. Iron ore imports showed an increase of nearly 1,000 tons.

THE GLASS MANUFACTURERS' ASSOCIATION have granted to the Flint Glassmakers' Society an advance of 10s. per week to every man.

MR. W. H. JOHNS, chief engineer to the Sheffield Gas Co., will shortly leave Sheffield to take control of the Swansea Gas Light Co.

MR. RUDOLPH H. DUXBURY, assistant manager of the Longwood Gasworks, has been appointed manager of the Batley Corporation Gasworks.

ADVANCED TECHNOLOGICAL COURSES in colour chemistry and dyeing are announced in the prospectus of evening work at the University of Leeds during the forthcoming session.

MR. NEVILLE HANBURY MANDER (Mander Brothers, varnish and paint manufacturers, Wolverhampton) has left estate of the value of £151,461.

SWANSEA HARBOUR TRUST have approved the application of the Anglo-Persian Oil Co., Ltd., for land at King's Dock, for the erection of seven oil tanks, with a holding capacity of 4,000 gallons each.

DR. JOHN K. WOOD, who has been principal assistant in Chemistry to the University College, Dundee, for the last twenty years, has been appointed to the lectureship in physical chemistry in the College of Technology of the University of Manchester.

AT THE NEXT MEETING of the Council of the University College of Wales, Aberystwyth, the professorship of chemistry, vacant by the appointment of Professor Findlay to the Chair of Chemistry at Aberdeen, will be filled.

SIR EDWARD MONTAGUE NELSON, K.C.M.G., of The Lawn, Warwick, one of the pioneers of the New Zealand meat exporting business, chairman and managing director of the Australian Chilling & Freezing Co., who died in February, has left £80,682 11s. 2d.

MESSRS. LEVER BROTHERS, Port Sunlight and Liverpool, who have embarked upon the manufacture of cattle foods, have published a useful calendar for 1919-1920. The publication includes portraits of prominent agriculturists, such as Lord Ernle, coloured photographs of prize animals, and articles by well-known writers.

THE DISPUTE BETWEEN the Amalgamated Society of Pharmacists, Drug and Chemical Workers, and the master pharmacists remains unsettled. A scheme was formulated, but it has been rejected by the men's union. The matters in dispute, which include improvements in wages and hours, will be submitted to arbitration.

A FIRE broke out recently in a quantity of pitch stored in an open tank on the premises of Messrs. J. & E. Morton, chemical manufacturers, Milnsbridge, near Huddersfield. About fifty tons of newly-made pitch had been run into the tank to cool, and it is presumed that it was set on fire by the sun. The damage is not serious.

A GOVERNMENT COMMITTEE OF TECHNICAL ADVICE on Printing in Egypt, in a Report issued on the possibilities of manufacturing paper in the country, points out that many experiments have been carried out with regard to papyrus. The yield of cellulose from papyrus, it is stated, is about 48 per cent., and the material is easily bleached. It is estimated that a fair quality good white paper could be produced from it, but no practical tests on a commercial scale have yet been made.

WE ARE INFORMED that the entire share capital of Messrs. Huntingdon, Heberlein & Co., Ltd., mechanical, chemical and metallurgical engineers, has been acquired by Messrs. Henry Gardner & Co., Ltd. The business premises of the former will in consequence be transferred to the registered offices of Henry Gardner & Co., Ltd., at 2, Metal Exchange Buildings, E.C.3. The Board of Messrs. Huntingdon, Heberlein & Co., Ltd., will consist of Mr. Walter Gardner (chairman and managing director), Mr. H. C. Bingham, Mr. H. J. Bush, and Mr. R. H. Bingham.

THE INTER-DEPARTMENTAL COMMITTEE on Power Alcohol has arranged with the London General Omnibus Company to run a number of motor-omnibuses for six months on alcohol-benzol

and alcohol-benzol-petrol mixtures, the results to be compared with running on petrol and other fuel. *Nature* states that by Christmas the committee may be able to publish information of such value as to enable the Government to take definite steps towards rendering power alcohol available for all users of internal combustion engines.

AT THE AUTUMN MEETING of the Iron and Steel Institute, which will be held at the Institution of Civil Engineers, Great George Street, Westminster, on September 18 and 19, there will be a conference on fuel economy, at which Dr. W. A. Bone, Sir Robert Hadfield, and Mr. A. Hutchinson will present on behalf of the British Association Fuel Economy Committee a report on fuel economy in steel works, and Mr. H. J. Yates one on fuel economy in foundry practice. Messrs. Cosmo Johns and L. Ennis will also contribute a paper on fuel economy in German iron and steel works, and, in addition, there will be a number of papers on technical questions relating to steel manufacture.

A DEPOSIT OF PETROLIFIC ASPHALT has been discovered at Cururupe, eight kilometres south of the Port of Ilheos. The seam is about 30 ft. in thickness, and the width up to the present has been verified up to nearly two miles. The seam descends from the sea shore at a decline of about 45 degrees. Distilling machines for the extraction of crude oil have been erected, but the work is now at a standstill pending the result of the analysis of samples sent to New York. Up to the present, the work has been financed by a Bahia merchant, but a syndicate is being formed in Rio de Janeiro, and the land surrounding the site experimented upon has been purchased by the syndicate, so that operations on a larger scale will take place shortly.

THE UNITED STATES COMMISSION OF INTERNAL REVENUE has authorized the following formula for the complete denaturation of alcohol in addition to formulae heretofore approved, this formula to be designated as formula No. 4:—To every 100 parts by volume of ethyl alcohol (of not less than 180° proof) there shall be added: two and five-tenths (2.5) parts by volume of approved benzol; five-tenths (0.5) parts by volume of nitrobenzol; two-tenths (0.2) parts by volume of approved pine oil (steam distilled). The following formula has been authorised in the manufacture of ethylene only: "To every 100 gallons of ethyl alcohol (of not less than 180° proof) there shall be added five gallons of sulphuric ether having a specific gravity of not more than 0.728 at 60° Fahrenheit."

IT IS EXPECTED that cheaper processes for the manufacture of a number of dyestuffs and medicinal preparations may result from discoveries made by experts of the United States Department of Agriculture who have been investigating ways of making certain sulphonic acids. With a view to helping the chemical industry of the United States, the department is offering to co-operate with manufacturers in establishing the process on a commercial scale. In the laboratory experiments, the sulphonation of a number of hydrocarbons has been studied; and, in some cases, the laboratory work has reached a stage that large-scale experiments are necessary to prove the value of the process. The work on benzene is most advanced. Sulphonated benzene is used in the manufacture of resorcinol and of synthetic phenol. The laboratory work on the sulphonation of other hydrocarbons is nearing completion.

AT MARLBOROUGH STREET POLICE COURT on Tuesday, William Richard Ashton, 46, described as a stock and share dealer, of Dora Road, Wimbledon Park, was charged with obtaining a cheque from Mr. John William Swindells for £18 with intent to defraud. It had been stated that Ashton had advertised extensively a "call-option" system, by which he stated that clients had the right to purchase from him certain specified shares at the price ruling on the day of purchase within a period of 30 days, the commission of the prisoner, who traded as W. & A. Wilson, in Regent Street, being 5 per cent. on the profits. Mr. Swindells sent a cheque for £18 to cover the purchase of 200 British Burma Oil shares, which were then rising in the market. He failed to get delivery of the shares, although he deposited their full value, and it was suggested by the prosecution that the prisoner never had any to sell. Mr. Francis Valentine Heir, assistant registrar to the British Burma Petroleum Co. (Ltd.), Queen Street Place, E.C., said that he knew nothing of Ashton or W. & A. Wilson as dealers in the shares. Inspector Crutchett, New Scotland Yard, stated that money deposits received by Ashton in respect of options in British Burma Oil shares amounted to £1,984 7s. 6d., but there was no record of any such shares having been sold to any person. The prisoner was again remanded on bail.

## Chemical Matters in Parliament

### Import Restrictions on Chemicals

Mr. Raffan asked the President of the Board of Trade (House of Commons, August 14), whether the licensing Sub-Committee (Dyes Department) of the Import Restrictions Department has the power, before granting permission for the importation of medicinal chemicals said to come within their province, to demand the name of actual manufacturers as well as that of the consignors, and to demand the original invoice, and to levy a charge of 1 per cent. on the said invoice, estimated at the rate of exchange at the time of granting permission to import?

Mr. Bridgeman: Chemicals of kinds which are intermediate materials for the manufacture of dyestuffs can be imported only under licence, and must be consigned to the Central Importing Agency, which is entitled to levy a charge of 1 per cent. to meet expenses incurred. This arrangement has been made by the licensing Sub-committee of the Trade, and Licensing Committee equally representative of dye-makers and dye-users established under the Government scheme for the encouragement of the dye-making industry, and has met with the general approval of all the interests concerned. The name of the actual manufacturer is necessary in order to prevent the indirect importation of German dyes and materials, and the invoice value for the purpose of calculating the agency fee. Chemicals suitable only for medicinal purposes are not included within the scope of the arrangement. The Licensing Sub-committee of the Dyes Department is distinct from the Import Restrictions Department. No fees are charged by the latter.

Mr. Raffan asked the President of the Board of Trade (House of Commons, August 14), whether the Department of Import Restrictions is asking why the requirements of chemical firms for such chemicals as diethyl barbituric acid, methyl sulphonol, and santoline cannot be satisfied in this country, notwithstanding the fact that these chemicals are not manufactured in Great Britain to any appreciable extent?

Mr. Bridgeman: No inquiry as to the chemicals named can at present be traced, but it is a usual matter of routine to inquire of applicants for licences whether their wants cannot be satisfied from home sources. When it is agreed that chemicals which are needed are not manufactured in this country to any appreciable extent licences to import them are freely issued.

Mr. Raffan asked the President of the Board of Trade (House of Commons, August 14), whether the Licensing Sub-committee (Dyes Department) of the Import Restrictions Department has the power, under Proclamation No. 29, to prohibit the importation of such chemicals as antipyrin, amidopyrin, and phenacetin, notwithstanding the fact that these chemicals are used entirely for medicinal purposes, and are not in any sense intermediary dye products?

Mr. Bridgeman: The three products named are undoubtedly intermediate coal tar products, but for the reason stated in the question, the duty of issuing licences for them has, by inter-departmental arrangement, been transferred from the Licensing Sub-committee of the Dyes Department to the Department of Import Restrictions.

Mr. Raffan asked the President of the Board of Trade (House of Commons, August 14), whether the importation of vanillin into this country has been entirely prohibited in spite of the fact that the entire output of British manufacturers has been sold up to the end of September; and whether the effect of this prohibition has been to increase the market price of vanillin from 45s. to 80s.?

Mr. Bridgeman: The importation of vanillin is not prohibited entirely; it is restricted to 50 per cent. of 1915 imports. I am not prepared to accept the suggestion in the latter part of the question.

Mr. Raffan: Is the hon. gentleman able to say that the price has not increased from 45s. to 80s. as the result of this restriction, and is he able to say whether it is not true that home manufacturers say they can fulfil no orders till the end of September?

Mr. Bridgeman: I did not say what the hon. member attributes to me. I did not admit that the whole increase is due to the import restrictions.

Mr. Raffan: I did not desire to suggest that the hon. gentleman answered the question that way, I desired to ask whether he is not able to say what the increase has been and if it is inaccurate to say the price has been increased from 45s. to 80s.

Mr. Bridgeman: I cannot be quite certain, but I will make further inquiry if the hon. member wishes.

### Royal Dutch Petroleum Co.

Lieut.-Commander Norman Craig asked the Chancellor of the Exchequer (House of Commons, August 18), what number of shares in the Royal Dutch Petroleum Co. were acquired by His Majesty's Government in and subsequently to November, 1917, without reference to the wishes of the holders of such shares; under what section of the Defence of the Realm Act, or the Regulations thereunder this interference with private property in invested moneys was undertaken; whether the compensation paid was at the rate of £51 per share or at what other price, and how such compensation was assessed; whether he was aware that the shares stand at the present time at £66 per share or, thereabouts, and that, but for the expropriation above-mentioned, the holders of such shares issue rights attaching thereto of considerable value would have enured to the benefit of such shareholders as exercised the same; whether any compensation has been paid for the deprivation of such rights; by whom are the shares now held; whether the issue rights obtained with the acquisition of the shares were and to what extent exercised by His Majesty's Government; what is the present market value of the shares so acquired, and of the shares acquired by virtue of any such issue rights, after deducting any payments made in respect of the latter class of shares; whether the acquisition of a particular form of private property was decided upon in order to maintain the Dutch exchange; whether the Government considered whether the desired result could have been obtained by borrowing and holding the shares; and whether it is proposed to grant any further consideration to the holders of shares expropriated as aforesaid?

Mr. Chamberlain: 5,323,100 florins shares in the Royal Dutch Petroleum Company were requisitioned under Treasury Order No. 5, of 1917, issued under Defence of the Realm Regulation 7c, the holders receiving compensation at the current market value at the time of requisition, at a cost to the taxpayer of over £2,700,000. I have no information as to the sixth and eighth parts of the question. The answer to the fourth, seventh, ninth and tenth parts is in the affirmative. As regards the last part, when private property has to be requisitioned for public purposes in times of national emergency, I do not see what fairer basis of compensation can be arrived at than the actual market value at the time of requisition, which of course, includes the estimate which the market puts on future prospects as well as the value of current profits. If it were suggested at the time of requisition that the risk of future depreciation should be taken by the late owner, I think he would be the first to object. If the taxpayer is to take this risk of depreciation the taxpayer must clearly be allowed to take any benefit arising from appreciation.

### Royal Dutch Company.

Lieut.-Colonel Murray asked the Chancellor of the Exchequer (House of Commons, August 18) whether he will state or give a Return showing what has been the result of the compulsory seizure in November, 1917, by the Treasury of shares in the Royal Dutch Company for working petroleum mines, stated to be seized in order to use them for the purpose of acting on the exchange, a payment of £51 per share being made to the owners by the Treasury as compensation for the seizure; what was the total number of shares then seized and the amount paid to the owners for them; how were they used to influence the rate of exchange; whether their use did in fact influence it, and, if so, how; and does His Majesty's Government propose to compensate those who were thus deprived of their property for a public purpose?

Mr. Chamberlain: I would refer the hon. and gallant member to the answer given to the hon. and gallant Member for the Isle of Thanet Division. The shares were sold abroad, and the proceeds used to support the exchange between this country and Holland.

Lieut.-Commander Kenworthy asked the Chancellor of the Exchequer (House of Commons, August 18) whether he will now state or will give a Return stating what has been the result of the compulsory seizure in November, 1917, by the Treasury of shares in the Royal Dutch Company for working petroleum mines, stated to be seized in order to use them for the purpose of acting on the rate of exchange, a payment of £51 per share being made to the owners by the Treasury as compensation for the seizure; what was the total number of shares then seized and what the amount paid to the owners for them; how they were used to influence the rate of exchange; whether their use did influence it; if so, how; and do his Majesty's Government propose to compensate those who were thus deprived of their property for a public object?

Mr. Chamberlain : I would refer the hon. and gallant Member to the answer given to the hon. and gallant Member for the Isle of Thanet Division. The shares were sold abroad, and the proceeds used to support the exchange between this country and Holland.

#### Muriate of Potash

Mr. John Dennis asked the President of the Board of Trade (House of Commons, August 18) (1) Whether a licence to import 200 tons of muriate of potash has been applied for by the West Norfolk Farmers' Manure Company, Ltd., a farmers' co-operative association ; whether such licence has been refused, the applicant being referred to the British Potash Company ; whether any valid reason exists for the restriction of trade liberty in the importation of this fertiliser ; and whether, in the event of the applicant being forced to buy from the rival concern named, he would undertake that the cost of this fertiliser in Lynn to the applicant shall not exceed its contract price with the Alsace-Lorraine Trading Company for the 200 tons in question ;

(2) The Parliamentary Secretary to the Board of Agriculture whether he is aware that muriate of potash is required for the manufacture of compound root manures ; whether the West Norfolk Farmers' Manure Company, Ltd., whose output is 20,000 tons of manure per annum, is not permitted to import muriates for their manufacture ; whether, in order to get the required production for next year's crop, its manufacture must be at once proceeded with ; and whether any shortage in production must have a detrimental effect on the 1920 crops of potatoes and other roots ;

(3) The Minister of Labour whether he is aware that the West Norfolk Farmers' Manure Company, Ltd., of King's Lynn, is unable to employ its plant and men owing to its inability to obtain a licence to import muriate of potash already contracted for and now awaiting shipments at Rotterdam ; whether its works are on the point of being closed down in consequence, entailing a large number of men being thrown out of employment ; and whether he can take any steps to avert this calamity ?

Sir A. Geddes : The application from the company was dated August 11, and has not yet been replied to. The requirements of the company will be filled by the British Potash Company, who hold a licence for the higher grade of potash salt referred to. The Alsace-Lorraine Trading Company do not import the higher grade salts, and if the West Norfolk Farmers' Manure Company, Ltd., have contracted to buy an import-prohibited article they should have first assured themselves that a licence would be issued. At the same time, it is probable that the muriate, which will arrive in the course of the next day or two, will be delivered at a price at least as favourable as that at which it could be obtained from the Alsace company. That price will be the f.a.s. price at Rotterdam, as fixed by international agreement, plus incidental expenses.

Mr. Dennis : Will the price added to the f.a.s. price Rotterdam be the freight price direct Rotterdam to King's Lynn, or will it be freight Rotterdam to London plus freight from London ? Cannot it be imported direct to King's Lynn ?

Sir A. Geddes : I should require notice of that before answering with absolute certainty, but I know of no reason why it should not be brought direct to King's Lynn.

#### Royalties on Derbyshire Oil

In reply to Mr. Holmes (House of Commons, August 18), Mr. Bonar Law stated that the Government had not come to a decision concerning the payment of royalties on the oil discovered in Derbyshire.

#### Fuel Research

Lieut.-Colonel Burgoyne asked the Chancellor of the Exchequer (House of Commons, August 18), whether, in view of the shortage of domestic and industrial fuel, the great demand for oil, and the publicity which is being given to the possibility of producing these substances from low-grade coal, colliery waste, and/or other bituminous material, he would consider the advisability of taking steps to protect the public from investing in schemes which are technically unsound ?

Mr. H. Fisher in reply stated : The Government are doing everything they can by setting up a Fuel Research Station for the purpose of providing the public with schemes which are technically sound to guard them against investing their money in schemes which are not technically sound.

Lieut.-Colonel Burgoyne asked the Prime Minister (House of Commons, August 18), what progress had been made to date in connection with the Government experimental Fuel Research Station at Greenwich ; what amount of money had been expended in connection therewith ; and whether any results had been obtained towards the utilisation of inferior coal and colliery waste which would tend to increase the amount of domestic and industrial fuel, solid and liquid, for public distribution and consumption during the coming winter months ?

Mr. H. Fisher replying said : The laboratories at the Fuel Research Station are completed and have begun work. The main building will, it is hoped, be completed next month. The recorded expenditure up to the present on buildings and equipment is £130,924, and it is estimated that the cost under these heads will be £193,588 when the station as at present planned is finished. It has not yet been possible to conduct experiments bearing on the last part of the question, but they will be undertaken in due course after the station is complete.

### A Trade Policy for Great Britain

#### The Prime Minister Explains

The Prime Minister in the House of Commons on Monday, dealt with the trade policy of this country in a speech of great length. It cannot be said to have had a reassuring effect, for neither labour nor the manufacturers are satisfied.

The general effect of the speech was to make people realise the grave commercial position of the country, unless steps are promptly taken to restore our trade. Our adverse trade balance, as between imports and exports, which was £150,000,000 before the war, promises at the present rate to be nearly £800,000,000—a truly appalling increase. The only remedy Mr. Lloyd George could suggest was increase of production. "We are spending more," he said, "we are earning less ; we are consuming more, we are producing less." As regards coal, he said, our production to-day is 87 million tons less per year than before the war. Reports from the United States, where wages are higher and the hours of labour no longer, the labour cost in relation to the articles produced is less.

Mr. Lloyd George spoke strongly on the "serious fallacy" of the "ca' canny" policy, which was possessing the minds of hundreds of thousands at the present time, and appealed to workmen, and even to employers, to abandon it. The facts, he said, had to be brought home to every man throughout the country to induce him to shake off the fatal lethargy and slackness which were at present depressing production and imperilling the vital interest of the nation. On the question of coal, Mr. Lloyd George said the Government accepted the policy of State purchase of mineral rights in coal, but were against nationalization. They also favoured proposals for the unification and reorganization of the industry to prevent waste, and for giving the miners a voice in the new organization.

Dealing with the restriction of imports and unstable key industries, he said that in the interests of fairness, as well as in the interests of British industry as a whole, the Government had decided to submit to Parliament proposals which would effectively deal with dumping, they proposed that the Board of Trade be equipped with emergency powers to check a sudden and undue importation of goods at prices altogether below the cost of production here owing to the collapse of exchanges.

The two best illustrations, he said, although they are not comprehensive, are synthetic dyes and optical glasses and lenses. They may represent a small percentage of the whole industry of the country, but their importance is quite out of proportion to their quantity. It is proposed that the Board of Trade shall have power to prohibit the import of these goods except under licence, and to prevent excessive imports a fee will be charged for the licence. It may even be necessary for some time to continue the assistance given to these industries, but care will be taken that no undue profits shall be made at the expense of the community. Another part of our trade policy is that connected with technical instruction, and the promotion of industrial research and invention. That is a vital part of any successful trade policy. During the war we have discovered how much we suffered from the fact that Germany had spent considerable sums of money upon technical instruction and research and invention, and I hope that the lesson will not be lost upon this country.



## References to Current Literature

Only articles of general as distinct from specialised interest are included and given in alphabetical order under each geographical subdivision. By publishing this digest within two or three days of publication or receipt we hope to save our readers time and trouble; in return we invite their suggestions and criticisms. The original journals may be consulted at the Patent Office or Chemical Society's libraries. A list of journals and standard abbreviations used will be published at suitable intervals.

### British

- BENZOL.** Benzol in coal gas. E. Saint-Claire Deville. *Gas J.*, August 19, 392-394. Account of work extending over many years in experimental works of Paris Gas Co.
- COAL.** Coal research in Germany. *Engineering*, August 15, 217-218. Editorial dealing with work of Kaiser Wilhelm-Institut für Kohlenforschung.
- FUEL.** Uses of coke. W. A. Tookey. *Gas World*, August 16, 122. Refers to Parrish's recent paper before Society of Chemical Industry (*CHEMICAL AGE*, July 19), and discusses various uses of coke.
- GAS.** Gas-fired air heaters. G. A. Lough. *Gas World*, August 16, 126. Describes gas-fired heater for air, to be used for evaporating liquids.  
Gas-fired furnace for case-hardening. *Gas World*, August 16, 126. Results of practical tests with regenerative gas-fired furnace.
- GERMANY.** Chemical plants in Cologne area. Part I. A. J. Allmand and E. R. Williams. *J.S.C.I.*, August 15, 285-287R. Description of Leverkusen works of F. Bayer and Co., comprising plants for sulphuric acid and cement from calcium sulphate, for synthetic nitric acid and sodium nitrate, and for electrolytic alkali and chlorine.
- GLASS.** Standardisation of laboratory glassware. *J.S.C.I.*, August 15, 280-285R. Report of Committee, with recommendations as to shape, sizes, &c.
- GLYCERIN.** Manufacture of fermentation glycerin in Germany during the war. *J.S.C.I.*, August 15, 287R. (See also *CHEMICAL AGE*, August 23.)
- POTASH.** Potash recovery at cement plants. A. W. G. Wilson. *J.S.C.I.*, August 15, 314-318T. Gives some results obtained in Canada, with operating costs.  
Socialisation of German potash industry. *Econom. Rev. of Foreign Trade* (War Office), August 12, 60-61.
- POWER.** Cheap power. W. A. Tookey. *Gas World*, August 16, 122-123. Discusses relative values of coke and anthracite in gas producers.
- RUBBER.** Eight years' work on synthetic rubber. *India Rubber J.*, August 16, 17-20. First portion of translation of article from *Gummi-Zeitung*.
- SUGAR.** Conference on production and consumption of sugar within the British Empire. *J.S.C.I.*, August 15, 287-314T. Preliminary report of Empire Sugar Supply (Technical) Committee and discussion thereon.
- VISCOSITY.** Gravimetric method of comparing viscosities of varnishes, &c. H. C. S. de Whalley. *Analyst*, August, 288-289.
- WORKS MANAGEMENT.** Education for management. H. P. Vowles. *Engineering*, August 15, 197. Lays stress on need for knowledge of sociology.

### Colonial

- GLASS.** Glass, with special reference to its production in South Africa. Part II. P. A. Wagner. *S. Afr. Jnl. of Industries*, June, 534-545.

### American

- LIGNITE.** Combustion experiments with N. Dakota lignite. H. Kreisinger, C. E. Augustine, and W. C. Harpster. *U.S. Bureau of Mines, Tech. Paper*, 207. As a result of tests, suggestions for design of boiler furnaces for burning lignite are put forward.
- POWER.** Reprints of Engineering Bulletins prepared by U.S. Fuel Administration in collaboration with Bureau of Mines. Combustion and flue-gas analysis (*Tech. Paper* 219); Saving

steam in industrial heating systems (*Tech. Paper* 221); Boiler water treatment (*Tech. Paper* 218).

### German

- CERAMICS.** Determination of elasticity of pottery glazes. *Keram. Runds.*, July 10 and 17, 193-195, 203-204.
- COAL.** Fifth year of war work of Kaiser Wilhelm Institute for Coal Research. *Chem. Zeit.*, July 26, 465.
- FUEL.** Utilisation of fossil fuels in years 1914-1918. A. Fürtt, *Z. angew. Chem.*, July 29, 236-240. Deals with recovery, treatment, and utilisation of by-products (ammonia, benzol, &c.).
- NITRIC ACID.** Determination of yield in ammonia-oxidation processes. J. Baumann. *Chem. Zeit.*, July 26, 466.
- ORE DRESSING.** Mechanical concentration of ores. E. Dreves. *Metall. u. Erz.*, July 8, 297-307. Mathematical treatment of the subject.
- PATENTS.** Patents and trade-marks in Czecho-Slovakia. E. Hüttner. *Z. angew. Chem.*, July 29, 240.
- RUBBER.** Recent methods for determination of caoutchouc. Utz. *Z. angew. Chem.*, July 29, 235-236. Comparison of methods. Preference given to those of Marquis and Hein and of Vaubel.

### Patents in 1918: Profits £135,890

THE thirty-sixth report of the Comptroller General of Patents, Designs, and Trade Marks, which deals with the year 1918, was issued on Wednesday. It shows that during the year 168 applications were made under emergency legislation for the avoidance or suspension of patent rights, and in 146 cases licences had been, or will be, granted. In the course of the year it was decided that the benefit of all enemy-owned patents should be vested in the custodian, and an order was made accordingly on October 31. From the date of the Vesting Order to the end of the year five applications for the grant of licences under such patents were received. The number of notifications deposited relating to foreign patents, designs and trade marks in 1918 was 662, as against 346 in 1917. The general business of the office shows that there were 21,839 applications for patents, 10,019 for designs, and 6,968 for trade marks. These compare respectively with the previous year with 19,285, 13,208, and 5,502. The receipts from patents fees were £314,431, and from designs fees £5,767, being decreases of £22,216 and £355 over the amounts for 1917. The total receipts were £345,405, as compared with £318,149 in 1917, an increase of £27,256. The surplus of receipts over expenditure was £135,890, as compared with £124,427 in 1917. During the year 3,451 trade marks were advertised and 3,055 were registered.

### Maximum Prices for Oil Cakes

THE Board of Agriculture announce that the following maximum prices for home-manufactured cakes and meals have been agreed upon between the Ministry of Food and the makers:—Linseed cake, containing from 8 to 10 per cent. oil, £25; cottonseed cake (black), £20; ditto (white), £19 10s.; palm kernel cake (in bulk), £17; extracted palm kernel meal (in bags, gross weight), £17; ground nut cake, decorticated, £24; ditto, semi-decorticated, £22; ground nut cake, undecorticated, £21; soya cake, £25; extracted soya meal (in bags, gross weight), £25; coconut cake (in bulk), £21; rape cake, £18; extracted rape meal (in bags, gross weight), £18; sesame cake, £23 10s. These prices are net cash per ton ex mill Hull, London, Bristol, and Liverpool to the farmer.

## Patent Literature

We publish each week a list of selected complete specifications accepted as and when they are actually printed and on sale. In addition, we give abstracts within a week of the specifications being obtainable. Readers can thus decide what specifications are of sufficient interest to warrant purchase, the only way of obtaining complete information. Lists of patent applications and of "convention" specifications open to inspection before acceptance are added; abstracts of the latter appear as soon as possible thereafter.

### Abstracts of Complete Specifications

- 129,667. NICKEL FROM ITS SULPHIDE OR OXIDE, RECOVERY OF. H. W. C. Annable, Aubrey Haw, Egham, Surrey, and Nickel Concentration, Ltd., 18, St. Swithin's Lane, London, E.C. 4. Application date, November 19, 1917.

A sulphide ore or matte of nickel is mixed with common salt, with or without a sulphidising agent such as pyrites, and water to form a stiff paste, and the mixture is heated to 800° to 1,000° C. in a non-oxidising atmosphere, such as steam or carbon dioxide. After heating for thirty to sixty minutes the mass is oxidised in contact with air at 500° to 600° C., which decomposes sulphates of copper and iron, but not that of nickel. The nickel salt is washed out with cold water, and the residue may be treated with sulphuric acid to recover copper.

- 129,699. NITRATES, PRODUCTION OF. Colonel H. E. F. Goold-Adams, 10, Prince's Street, Westminster; Lieut. J. R. Partington, School Lane, Lostock Gralam, Cheshire; and Lieut. E. K. Rideal, 28, Victoria Street, London, S.W. 1. Application date, November 29, 1917.

Oxides of nitrogen are passed continuously through a series of scrubbers or towers in the same direction as, or in counter current to, a suitable solution of hydroxide or carbonate. The mixture of nitrite and nitrate first produced is gradually converted into substantially pure nitrate in each absorption space in succession, and the space is then cut out of the system. The lower oxides of nitrogen produced in each tower by the oxidation of the nitrite are converted into nitrogen peroxide by providing an oxidation space between successive towers, to which air or oxygen is admitted in sufficient quantity.

- 129,709. ACID-RESISTING TANKS, CONDUITS, AND THE LIKE. Brookes Chemicals, Ltd., and N. Brooke, Lightcliffe Chemical Works, near Halifax, Yorks. Application date, December 3, 1917.

The tank or conduit is constructed of several courses of bricks, which are heated before being placed in position, and are bound together by fused sulphur. The tank is provided with an outer layer on the sides and bottom of asphalt or bituminous composition. The tank is finally surrounded by an outer wall of brickwork, the bricks of which are laid or grouted in ordinary cement.

- 129,721. SMOKE AND FUME OR OTHER DUST-LADEN GAS, TREATMENT OF. W. E. Gibbs, 33, Lumsden Avenue, Southampton; R. J. Gilderson, 59, Avenue Road, Woolston, Southampton; and Colonel H. E. F. Goold-Adams, 10, Prince's Street, Westminster. Application date, December 7, 1917.

Waste gases or fumes containing finely divided particles in suspension are passed through an expanding conduit, where they meet a number of transverse jets of steam or other gas. The fine particles are thus caused to coalesce into larger particles, which are intercepted by a number of filter screens, through which the gas is passed. The screens are composed of textile material, such as worsted, which is stretched on both sides of the filtering frames, which are arranged transversely across the filtering chamber. The construction and mounting of these frames and the method of collecting the deposited material are described in detail. The method is suitable for the recovery of zinc oxide from the fumes of a brass foundry furnace.

- 129,758. HIGH TEMPERATURE REACTIONS, METHODS OF AND APPARATUS FOR CONDUCTING. N. Testrup and Techno-Chemical Laboratories, Ltd., "Fairlawn," Clarence Road, Clapham, London, S.W. 4. Application date, June 12, 1918.

A flat, horizontal combustion chamber is strongly heated internally by gas, and is provided with a floor of a heat conducting refractory substance, such as a thin slab of magnesia. The material to be treated is passed continuously by a flat travelling conveyor immediately below the floor. The conveyor is protected

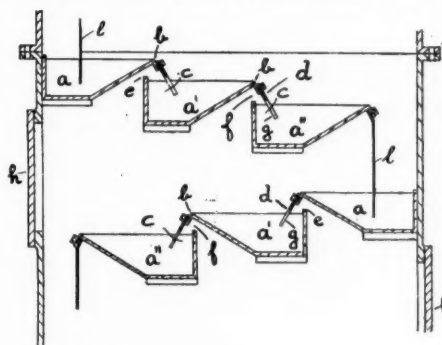
in the reaction zone by a layer of inert material which is deposited on it before it reaches the reaction zone, from a hopper above, outside the furnace. The material to be treated is deposited on the inert layer from a hopper, the discharge of which is close to the point where the conveyor passes below the furnace wall. The furnace walls extend slightly below the refractory bottom, so as to form a narrow, flat, high-temperature chamber between the bottom and the material on the conveyor, and an outlet pipe from this chamber is provided for the gaseous products of the reaction. Means are provided to separate the treated material from the layer of inert material. The apparatus is suitable for distilling coal.

- 129,760. ELECTRIC FURNACES. The Morgan Crucible Co., Ltd., and C. W. Speirs, Battersea Works, Battersea, London. Application date, June 14, 1918.

Relates to electric furnaces of the class in which the container is formed of a conductor, through which the current passes, and which is heated by a three-phase current. The container is circular in plan, and is provided with three integral lateral extensions, which are water-cooled and to which terminals are attached. The container is mounted on a firebrick seating, which is enclosed in a metal casing having a curved bottom, which rests upon rollers to enable the furnace to be tilted. A cover for the furnace may be formed of a similar container inverted, and provided with terminals, so that it may also be heated.

- 129,765. AMMONIACAL LIQUORS AND THE LIKE, DISTILLATION OR TREATMENT OF. W. Wyld, "Roseville," Menston, near Leeds. Application date, December 18, 1918.

A series of troughs, *a, a', a''* are arranged parallel to one another across the interior of a tower. Each trough is provided with a flange *d* overlapping the adjacent trough, which is slightly



129,765.

lower, and dipping into the liquid in that trough. A space *f* is left, so that the steam or other heating medium may pass through it laterally into the liquid. The depending edge *d* may be serrated or corrugated, and the flange itself is adjustable in height, so as to vary the amount of immersion in the liquid without altering the troughs in any other way.

- 129,771. HIGH TEMPERATURE REACTIONS, METHODS OF AND MEANS FOR CONDUCTING. N. Testrup and Techno-Chemical Laboratories, Ltd., "Fairlawn," Clarence Road, Clapham, London, S.W. 4. Application date, July 3, 1918.

The apparatus is of the same general type as that described in Specification 129,758 (see above). The conveyor in its movement below the heated combustion chamber passes over a horizontal plate forming the top of a flat chamber through which the air or gas used for heating the furnace is passed to pre-heat it. The conveyor consists of a moving train of scrapers or bars, and the material is deposited on the horizontal plate from a hopper

at one end. The air from the pre-heating chamber enters the uppermost of a series of zigzag horizontal passages above the conveyor, at the end at which the conveyor enters the furnace. The products of combustion pass over the material to be heated, and then through a series of zigzag horizontal passages which are intermediate with those through which the air circulates, so that the latter is further heated by the waste heat. The supporting plate for the material is extended on the discharge side to form a perforated grid, through which any untreated material falls and is returned by a conveyor and elevator to be heated again.

129,829. GAS WASHERS. A. J. Liversedge, 20, Essex Street, Strand, London, W.C. 2, and Dr. W. B. Davidson, Kafir Road, Egerton, Huddersfield. Application date, July 29, 1918.

The gas-washing tower is divided into a number of chambers by horizontal partitions, and the gas is admitted into the lowest chamber. The partitions are formed as shallow trays, and are provided with a number of parallel slots, each with a surrounding upstanding flange. The washing liquor is admitted at the top of the tower, and passes downward through each tray by overflowing the above-mentioned flanges. The liquid in each tray is withdrawn by a pump, and immediately returned under pressure to a series of perforated pipes in the tray between the slots, so that the liquid is projected into the chamber as a fine spray. Each slot is covered by a small hood, so that the gas in passing upwards through the slots is deflected and broken up. The gas on reaching the top of the tower is passed in a zig-zag course between baffles to remove any suspended liquid.

129,830. FURNACES AND OTHER HEATING APPLIANCES, CONSTRUCTION OF. G. H. Roberts and W. N. Booth, Royal Arsenal, Woolwich, S.E. 18. Application date, January 27, 1919.

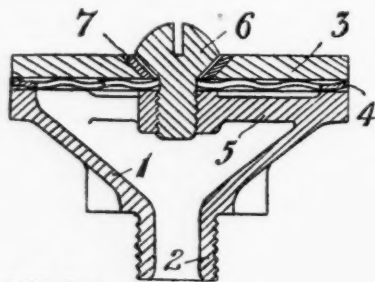
The waste gases from the furnace pass out at the top into a space between the heating chamber and the outer walls of the furnace. The gases pass downwards through this space into a recuperator provided in a horizontal flue below the furnace, and thence to the chimney. The air and fuel gas pass through the recuperator in the opposite direction to that of the waste gas. The outer wall of the furnace may be surrounded by a layer of heat-insulating material, and finally by an outer casing, or the wall itself may be constructed of heat-insulating material. The application of the invention to a muffle furnace, a crucible tilting furnace, and a billet-heating furnace is also described.

129,850. SULPHATE OF AMMONIA, MANUFACTURE OF. The Oakbank Oil Co., Ltd., and J. Wishart, 29, Saint Vincent Place, Glasgow. Application date, August 26, 1918.

In the manufacture of sulphate of ammonia the free acid is neutralised by adding a measured quantity of ammonia liquor. The ammonia is added immediately before the mother liquor is separated from the salt by centrifugal or equivalent apparatus.

129,859. FILTRATION APPARATUS. D. M. Stewart, 166, Buchanan Street, Glasgow. Application date, September 4, 1918.

A screen for a filtration apparatus consists of a cup-shaped chamber 1, with an inlet passage 2, and a cap 3. An annulus 4, having radial corrugations, is inserted between the parts 1 and 3,

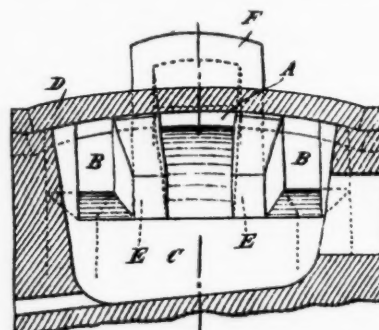


129,859

and secured by a screw 6, screwing into a spider member 5. The corrugated annulus provides a number of elongated openings for the passage of the liquid. The conical washer 7 may be similarly corrugated.

129,869. FURNACE ENDS OF THE OPEN HEARTH TYPE. W. J. Mellersh-Jackson, London (from Societa Anonima Ch. M. Stein & Co., 9, Via Due Macelli, Rome). Application date, September 19, 1918.

The improvement relates to open hearth regenerative furnaces of the Siemens or Martin Neinkoff type. The illustration shows a cross section through the furnace just in front of the air and



129,869.

gas delivery conduits. The air passages B are, arranged on both sides of the gas passage A, from which they are separated by partitions E projecting forward towards the hearth C. The roof D of the furnace joins the supply passages in a curve, which avoids edges or corners. The only projections which are subjected to intense heat are thus the partitions E, and these are formed so as to be readily renewable.

129,885. GAS PURIFIERS, CONSTRUCTION OF GRIDS FOR. J. A. Spencer, of Walter Spencer & Sons, Scotts Road, Southall, Middlesex. Application date, October 18, 1918.

The framework of the flat grids is constructed with tapered recesses to receive correspondingly tapered longitudinal bars, which are secured by oblique nails or pins driven through both parts.

129,905. FILTERING PROCESS AND APPARATUS, CONTINUOUS PRESURE. J. A. McCaskell, 321, Felt Building, Salt Lake City, Utah, U.S.A. Application date, November 21, 1918.

The liquid to be filtered is maintained under pressure in a casing containing an inner rotatable filter. The solids are deposited on the filter surface, and are washed as it rotates. The solids are withdrawn in a semi-dry condition by a scraper into a trough, from which they are removed by a conveyor.

129,943. BURNER INTENDED TO BE PLACED UNDER A CRUCIBLE OR OTHER RECEPTACLE CONTAINING MOLTEN METAL. M. Mathy, 28, Rue Leopold, Flémalle-Grande, Belgium. Application date, February 27, 1919.

To avoid damage to the burner by the breaking of the crucible the burner is provided with a vertical passage right through it, closed at the bottom by a plate of material having a lower melting-point than that in the crucible. The gas enters the burner at the side. Molten metal falling into the burner melts the closing plate and escapes at the bottom.

#### Specifications Accepted, with Date of Application

130,020. Electric Arc Furnaces. H. Coates and Watford Electric and Manufacturing Co. December 19, 1917.

130,023. Ammonia, Synthesis of. E. B. Maxted. December 21, 1917.

130,063. Ammonia, Synthesis of. E. B. Maxted. January 11, 1918.

130,069. Ammonia, Manufacture of. R. C. Parsons, H. C. Jenkins, and C.I. (1914) Syndicate. January 11, 1918.

130,086. Exothermic Chemical Syntheses taking place under Pressure and at a High Temperature. L'Air Liquide, Soc. Anon. pour L'Etude et L'Exploitation des Procédes G. Claude. March 31, 1917.

130,087. Exothermic Chemical Syntheses. L'Air Liquide, Soc. Anon. pour L'Etude et L'Exploitation des Procédes G. Claude. August 7, 1917. (Addition to above.)

130,092. Separation of Gaseous Mixtures, and particularly the Extraction of Hydrogen from Gaseous Mixtures. L'Air



- Liquide, Soc. Anon. pour L'Etude et L'Exploitation des Procédés G. Claude. April 16, 1917.
- 116,495. Nitric Acid, Manufacture of. Norsk Hydro-Elektrisk Kvaestofaktieselskab. May 8, 1917.
- 130,106. Coke Ovens and the like, Regulating the Pressure in the Gas Mains of. Simon-Carves, Ltd., and J. T. E. Preston. April 23, 1918.
- 130,104. Aluminium Intermediate Products and Bleaching Powder, Treatment of Suitable Clay or Aluminium Compounds for the Production of. R. Welford. July 27, 1918.
- 130,173. Carbonates and/or Hydrates of Potassium and Sodium, Separation of. Distillates, Ltd., and G. G. Jarman. August 2, 1918.
- 130,175. Mechanical Retorts or Heating Chambers. T. Phillips. August 8, 1918.
- 130,181. Evaporators. J. A. Reavell and Kestner Evaporator and Engineering Co. August 9, 1918.
- 119,234. Electric Melting-Furnaces. T. F. Baily and F. T. Cope. September 4, 1917.
- 119,243. Cyanides and Nitriles, Synthetic Production of. A. R. Lindblad. June 8, 1917.
- 130,205. Electric Furnaces. J. R. Hoyle and P. W. Fawcett. September 20, 1918.
- 130,274. Gas-heated Furnaces. King, Taudevin & Gregson, W. Gregson, and J. King. February 1, 1919.
- 130,288. Electric Furnaces. G. Marriott. March 3, 1919.

#### Latest Specifications Open to Inspection

- 130,962. Solvents, Recovery of. E. I. Du Pont de Nemours & Co. August 8, 1918.
- 130,963. Fertilisers, Manufacture of. C. Rossi. August 9, 1918.
- 130,968, 130,969, 130,970. Esters, Continuous Process for the Manufacture of. U.S. Industrial Alcohol Co. August 7, 1918.
- 130,974. Coke Ovens. Soc. de Fours a Coke et a Entreprises Industrielles. August 9, 1918.
- 130,978. Dehydrating, Reducing, Calcining, or Roasting Minerals and other Pulverulent Materials. J. Rére, August 9, 1918.
- 130,979. Nitrate of Calcium of High Percentage, Solutions of. Nitrum Akt. Ges. August 6, 1918.

#### Chemical Trade Inquiries

THE *Board of Trade Journal* announces that there have recently been an increasing number of cases where firms desirous of obtaining information have addressed their enquiry both to the Department of Overseas Trade, London, and to the Consular Officer or Trade Commissioner of the district or country in which they are interested. It should be understood that the Department of Overseas Trade refers any such enquiries which cannot be directly dealt with to the Commercial Secretaries, Consuls, &c., to whom it looks as its agents in the collection of commercial intelligence. In these circumstances, the method of addressing enquiries to both sources not only leads to needless duplication of work on the part of the Department, the Consul and the firm itself, but frequently causes unnecessary loss of time. It is, therefore, recommended that all such applications for information should be addressed solely to the Department of Overseas Trade (Development and Intelligence), 4, Queen Anne's Gate Buildings, Old Queen Street, London, S.W. 1, except where otherwise stated.

| LOCALITY OF FIRM OR AGENT. | MATERIALS.   | REF. No. |
|----------------------------|--|----------|
| Australia (Victoria).      | Sodium Acetate (Commercial).   | 32,485   |
| Australia (Melbourne).     | Sulphate of Copper.  | 1,578    |
| Australia and New Zealand. | Drugs, Dyes and Proprietary Articles. (Replies to the Agent-General for New South Wales, 28, Cockspur Street, London, S.W. 1.) |          |
| India (Rangoon).           | Druggists' Supplies.   | 367      |
| India (Madras).            | Asbestos, Dyes, &c.  | 370      |

| LOCALITY OF FIRM OR AGENT.                          | MATERIALS.  | REF. No. |
|---|---|----------|
| British West Indies (Port of Spain, Trinidad, &c.). | Drugs and Chemicals, &c.  | 375      |
| South Africa.                                       | Oil.  | 387      |
| Scandinavia.  | Soda Ash.   | 400      |
| Switzerland (Lausanne).                             | Chemicals, Drugs.   | —        |
| Switzerland (Bâle).                                 | Chemicals, Rubber.  | 475      |
| Canada.   | Chemicals, Proprietary Preparations in Druggists' Goods.  | 420      |
| Turkey.   | Glass and Enamelled Ware, Soda, Chemicals.  | —        |
| Poland.   | Chemicals, Soap, Rubber Goods, Ceramic Goods. (Replies to Secretary, Polish Commercial and Financial Agency, Commission Internationale de Ravitaillement, 88, Kingsway, London, W.C.2.) | —        |
| Cuba.   | Drugs and Chemicals.  | 495      |
| Australia (Sydney)                                  | Chemists' Supplies  | 411      |
|   | Plate and Sheet Glass   | 415      |
| Australia (Melbourne)                               | Heavy chemicals   | 412      |
|   | Candle Machinery and Candle Wicks.  | 69/6/13  |
|   | Replies to Official Secretary, Commonwealth of Australia, Commercial Information Bureau, Australia House, Strand, London, W.C.2.  |          |
| Canada  | Plate Glass. Replies to Canadian Govt. Trade Commissioners' Office, Portland House, 73, Basinghall St., London, E.C.2.  | —        |

#### Contracts Open

LEATHERHEAD.—Slag tar macadam for the Urban District Council. Particulars from Mr. S. R. Drake, engineer and surveyor, Council Offices, Leatherhead. Tenders by 4 p.m., August 26.

BARKING.—Portland cement, oil and colourmen's goods, and petroleum oil. Particulars from the Surveyor's Office, Clock House Chambers, Barking. Drugs and chemists' goods. Particulars from Clerk's Offices, Public Offices, Barking. Tenders by 7 p.m. September 9.

ROCHESTER.—(2) Portland cement, (6) oils, for the Rochester Corporation. Particulars from the City Surveyor, Guildhall, Rochester. Tenders by 4 p.m. September 2.

STEPNEY.—(4) Colours, varnishes, (6) oilmen's goods. Particulars from Mr. M. W. Jameson, A.M.I.C.E., Municipal Offices, 15, Great Alie Street, Whitechapel, E. 1. Tenders by 12 noon, September 6.

#### Work in Prospect

ABERDEEN.—Plans have been passed for additions and alterations to cold storage sheds at the Sandilands Chemical Works for John Miller & Co., manufacturing chemists.

CHESTER-LE-STREET.—The Rural District Council has approved plans for additions to the Washington Chemical Company's offices.

GRANGEMOUTH.—Large dyeworks are to be erected at Grangemouth by the Scottish Dyes, Ltd., whose head establishment is at Carlisle. An area of 80 acres has been secured close to the canal and railway line. The plans show buildings to cost £50,000.

HEYWOOD.—The Council has approved plans for extensions to works in Bradshaw Street for the Roe Acre Dyeing and Felting Company.

NELSON.—The Town Council has passed plans for a coal store for Penny Brothers, Premier Dye Works.

OLDHAM.—S. Davies & Sons, dyers, have decided to carry out extensions at their works.

## Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. Only commodities whose values are at the time of particular interest or of a fluctuating nature are included in our weekly report. A more complete list and report, including a Continental and American report, appears in the first issue of each month, and will include prices of plant supplies, building materials, structural steel, fuels, glues, ores, refractories, metals, minerals, and miscellaneous materials, as soon as the necessary arrangements are completed. Our issue of August 2 contained some of these items. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report. Suggestions and criticisms in regard to these pages will be welcomed.

### Market Report

THURSDAY, August 21, 1919.

THERE has been a steady demand for chemicals during the current week, and there is a larger number of enquiries in the market for forward delivery.

Values are firmly maintained with one or two exceptions.

Export trade is satisfactory, and difficulty is now being experienced in one or two directions in filling foreign buyers' requirements.

#### General Chemicals

ACID ACETIC.—The American makers have notified slight advances in their prices of 80 per cent. and Glacial.

ACID CARBOLIC.—Export business shows no sign of falling off at present, and manufacturers have no difficulty in selling their outputs at full market prices.

ACID CITRIC.—Owing to the unusually heavy demand from America, prices are hardening in Italy, and we will probably see a firmer market presently.

ACID LACTIC.—This product may be imported again from Germany, in which case an important reduction in price may be expected.

ACID OXALIC.—Reports of lower prices are current from the Continent, but no actual transactions have been effected.

ALUM is in good demand, and is scarce on the spot.

ARSENIC.—The position remains very firm, and it is difficult to obtain offers of large quantities.

BARIUM SALTS.—Large quantities appear to be available on the Continent, and we doubt whether the present high prices ruling here can remain much longer in force.

BLEACHING POWDER is slightly easier, but the demand, if anything, is slightly better.

COPPER SULPHATE is stagnant, and there is nothing of interest to report.

CREAM/TARTAR.—The small quantities in second hands are being rapidly absorbed, and better prices are now obtainable for forward delivery.

FORMALDEHYDE.—In consequence of the rise in methyl alcohol, the price of formaldehyde will no doubt be advanced by the American makers.

LEAD ACETATE.—There is an improvement in the demand, and values are well maintained.

SAL. AMMONIAC.—Supplies are practically unobtainable for early delivery, and export orders are being declined.

SODIUM CAUSTIC.—British makers appear to be well sold ahead, and higher prices for second-hand parcels are being quoted.

SODIUM HYPOSULPHITE.—The present rate of production will have to be considerably increased when the anticipated demand revives.

SODIUM PHOSPHATE is quiet, without change in value.

SODIUM PRUSSATE.—A small business has been done. The present price is very low in comparison with that of the potash salt.

### Heavy Coal Tar Products

The market is still somewhat irregular, and, owing to the uncertainty of future supplies of raw material, manufacturers are not anxious to make sales except for prompt delivery.

BENZOL.—The home trade is fairly active, and in consequence a slight advance has been paid for export, which is now quoted at 18. 10d. to 18. 10½d. per gallon.

CREOSOTE.—The market is steady at 5½d. to 5½d. per gallon in the North, and 6d. per gallon in the South.

CRESYLIC ACID.—There is more demand, and makers now ask 28. 4½d. to 28. 7½d. per gallon at works for pale 97 per cent. Dark 95 per cent. is neglected, and is at a greater discount than usual.

NAPHTHALENE.—There is a quiet demand, and prices are unchanged at £5 to £7 for crude, and £17 to £19 per ton for refined.

PITCH.—There is still a good demand, and prices have advanced. The quantity available for the next season is now very much reduced, as manufacturers have been free sellers at the rising prices.

SOLVENT NAPHTHA.—There is some demand, and the production has fallen off considerably owing to the coal strike in Yorkshire. To-day's prices are 28. to 28. 2d. per gallon in the North, and 28. 3d. to 28. 4d. per gallon in the South.

### Sulphate of Ammonia

Prices are unchanged, but, owing to the restricted output, permits for export are still refused.

### Coal Tar Intermediates

ANILINE OIL AND SALT continue in strong demand, important inquiries arriving from the East.

ANTHRANILIC ACID.—It appears that American manufacturers have now greatly increased their production, and are soliciting business forward at greatly reduced prices.

PHTHALIC ANHYDRIDE.—There has been a decided drop in the American price of this product, consequent upon the increased production.

### Current Prices

| Chemicals                           | per | August 21, 1919. |    |    |            |
|-------------------------------------|-----|------------------|----|----|------------|
|                                     |     | £                | s. | d. | £ s. d.    |
| Acetic anhydride .....              | lb. | 0                | 2  | 9  | to 0 3 0   |
| Acetone, pure .....                 | ton | 95               | 0  | 0  | to 97 0 0  |
| Acid, Acetic, glacial, 99-100% .... | ton | 82               | 10 | 0  | to 84 0 0  |
| Acetic, 80% pure .....              | ton | 63               | 0  | 0  | to 65 0 0  |
| Carbolic, crystal, 39-40° .....     | lb. | 0                | 0  | 9  | to 0 0 9½  |
| Citric .....                        | lb. | 0                | 4  | 5  | to 0 4 6   |
| Lactic, 50% vol. ....               | ton | 66               | 0  | 0  | to 68 0 0  |
| Acid, Lactic, 60% vol. ....         | ton | 83               | 0  | 0  | to 85 0 0  |
| Oxalic .....                        | lb. | 0                | 1  | 2½ | to 0 1 3   |
| Pyrogallol cryst. ....              | lb. | 0                | 11 | 6  | to 0 11 9  |
| Tannic, coml. ....                  | lb. | 0                | 2  | 9  | to 0 3 0   |
| Tartaric .....                      | lb. | 0                | 3  | 3  | to 0 3 4   |
| Alum, lump .....                    | ton | 17               | 10 | 0  | to 17 15 0 |
| Aluminium sulphate, 14-15% ....     | ton | 13               | 10 | 0  | to 14 0 0  |
| Aluminium sulphate, 17-18% ....     | ton | 17               | 0  | 0  | to 17 10 0 |
| Ammonia, anhydrous .....            | lb. | 0                | 1  | 8  | to 0 1 9   |
| .....880 .....                      | ton | 32               | 10 | 0  | to 37 10 0 |
| Carbonate .....                     | lb. | 0                | 0  | 6½ |            |
| Muriate .....                       | ton | 45               | 0  | 0  | to 47 0 0  |
| Nitrate .....                       | ton | 55               | 0  | 0  | to 57 10 0 |
| Phosphate .....                     | ton | 112              | 0  | 0  | to 115 0 0 |

|                                       | per   | £ s. d. | £ s. d.    |
|---------------------------------------|-------|---------|------------|
| Arsenic, white 99-100% .....          | ton   | 55 0 0  | to 57 10 0 |
| Barium, Carbonate, 92-94% .....       | ton   | 12 0 0  | to 13 0 0  |
| Chloride .....                        | ton   | 25 10 0 | to 26 0 0  |
| Nitrate .....                         | ton   | 50 0 0  | to 51 0 0  |
| Sulphate (blanc fixe), dry .....      | ton   | 25 10 0 | to 26 0 0  |
| Sulphate (blanc fixe), pulp .....     | ton   | 15 10 0 | to 16 0 0  |
| Bleaching powder, 35-37% .....        | ton   | 13 0 0  | to 13 10 0 |
| Borax crystals .....                  | ton   | 50 0 0  | to 52 0 0  |
| Calcium acetate, grey .....           | ton   | 20 10 0 | to 22 0 0  |
| Calcium chloride .....                | ton   | 8 10 0  | to 9 0 0   |
| Casein, technical .....               | ton   | 78 0 0  | to 80 0 0  |
| Cobalt oxide, black .....             | lb.   | 0 7 9   | to 0 8 0   |
| Copper sulphate .....                 | ton   | 41 0 0  | to 45 0 0  |
| Cream Tartar, 98-100% .....           | ton   | 240 0 0 | to 250 0 0 |
| Epsom Salts (see Magnesium Sulphate). |       |         |            |
| Iron, perchloride .....               | ton   | 32 0 0  | to 34 0 0  |
| Sulphate (copperas) .....             | ton   | 4 15 0  | to 4 17 6  |
| Lead, Acetate, white .....            | ton   | 82 10 0 | to 85 0 0  |
| Carbonate (White Lead) .....          | ton   | 51 0 0  | to 55 0 0  |
| Nitrate .....                         | ton   | 58 0 0  | to 59 0 0  |
| Lithopone, 30% .....                  | ton   | 41 0 0  | to 45 0 0  |
| Magnesium, Chloride .....             | ton   | 15 0 0  | to 16 0 0  |
| Carbonate, light .....                | cwt.  | 3 0 0   | to 3 5 0   |
| Sulphate (Epsom salts, coml.) ..      | ton   | 11 10 0 | to 12 10 0 |
| Sulphate (druggist's) .....           | ton   | 17 0 0  | to 18 0 0  |
| Methyl Acetone .....                  | ton   | 89 0 0  | to 90 0 0  |
| Methyl Alcohol, -1% Acetone .....     | gall. | 0 10 6  | to 0 11 0  |
| Potassium, Bichromate .....           | lb.   | 0 1 6   | to 0 1 7   |
| Carbonate, 99% .....                  | ton   | 93 0 0  | to 95 0 0  |
| Chlorate .....                        | lb.   | 0 1 2   | to 0 1 3   |
| Metabisulphite, 50-52% .....          | ton   | 210 0 0 | to 220 0 0 |
| Nitrate refined .....                 | ton   | 58 0 0  | to 60 0 0  |
| Permanganate .....                    | lb.   | 0 3 3   | to 0 3 6   |
| Prussiate, yellow .....               | lb.   | 0 1 10  | to 0 1 11  |
| Prussiate, red .....                  | lb.   | 0 6 0   | to 0 6 3   |
| Sulphate .....                        | ton   | 37 10 0 | to 40 0 0  |
| Sal Ammoniac, firsts. ....            | cwt.  | 4 0 0   |            |
| Sal Ammoniac, seconds. ....           | cwt.  | 3 15 0  |            |
| Sodium, Acetate .....                 | ton   | 52 0 0  | to 55 10 0 |
| Arseniate, 45% .....                  | ton   | 47 10 0 | to 48 10 0 |
| Bicarbonate .....                     | ton   | 9 0 0   | to 9 10 0  |
| Bisulphite, 60-62% .....              | ton   | 30 0 0  | to 31 0 0  |
| Chlorate .....                        | lb.   | 0 0 7   | to 0 0 7½  |
| Caustic, 70% .....                    | ton   | 20 0 0  | to 20 10 0 |
| Caustic, 76% .....                    | ton   | 23 10 0 | to 24 0 0  |
| Hyposulphite, coml. ....              | ton   | 18 10 0 | to 19 10 0 |
| Nitrite, 96-98% .....                 | ton   | 58 10 0 | to 60 0 0  |
| Phosphate cryst. ....                 | ton   | 25 0 0  | to 25 10 0 |
| Prussiate .....                       | lb.   | 0 0 7½  | to 0 0 8   |
| Sulphide, cryst. ....                 | ton   | 15 10 0 | to 16 0 0  |
| Sulphide, solid, 60-62% .....         | ton   | 22 0 0  | to 23 10 0 |
| Sulphite, cryst. ....                 | ton   | 11 0 0  | to 11 10 0 |
| Strontium, Carbonate .....            | ton   | 85 0 0  | to 90 0 0  |
| " Sulphate, white .....               | ton   | 8 10 0  | to 10 0 0  |
| Sulphur, chloride .....               | ton   | 38 0 0  | to 40 0 0  |
| Tetrachlorethane (Westron) .....      | ton   | 60 0 0  | to 65 0 0  |
| Tin perchloride, 33% .....            | lb.   | 0 2 4   | to 0 2 5   |
| " Protochloride (tin crystals) ..     | lb.   | 0 1 9   | to 0 1 10  |
| Trichlorethylene (Westrosol) .....    | ton   | 75 0 0  | to 80 0 0  |
| Zinc, chloride, 102 Tw. ....          | ton   | 22 0 0  | to 23 0 0  |
| Chloride, solid, 96-98% .....         | ton   | 60 0 0  | to 62 10 0 |
| Sulphate .....                        | ton   | 21 10 0 | to 23 0 0  |
| Oxide, Redseal .....                  | ton   | 75 0 0  | to 80 0 0  |

## Coal Tar Intermediates, &amp;c.

|                                    |     |        |           |
|------------------------------------|-----|--------|-----------|
| Alphanaphthol, crude .....         | lb. | 0 3 0  | to 0 3 6  |
| Alphanaphthol, refined .....       | lb. | 0 3 6  | to 0 3 9  |
| Alphanaphthylamine .....           | lb. | 0 2 6  | to 0 2 9  |
| Aniline oil, drums free .....      | lb. | 0 1 3  | to 0 1 4  |
| Aniline salts .....                | lb. | 0 1 3½ | to 0 1 4  |
| Anthracene, 85-90% .....           | lb. | 0 1 5  | to 0 1 6  |
| Anthranilic acid .....             | lb. | 0 16 0 | to 0 17 0 |
| Benzaldehyde (free of chlorine) .. | lb. | 0 3 6  | to 0 3 9  |
| Benzidine, base .....              | lb. | 0 5 6  | to 0 6 0  |
| Benzidine, sulphate .....          | lb. | 0 4 9  | to 0 5 0  |
| Benzoic acid .....                 | lb. | 0 5 0  | to 0 5 3  |
| Benzoate of soda .....             | lb. | 0 5 0  | to 0 5 3  |
| Benzyl chloride, technical .....   | lb. | 0 1 9  | to 0 2 0  |
| Betanaphthol ben oate .....        | lb. | 1 6 0  | to 1 7 6  |
| Betanaphthol .....                 | lb. | 0 2 3  | to 0 2 6  |
| Betanaphthylamine, technical ..... | lb. | 0 6 6  | to 0 7 0  |
| Dichlorobenzol .....               | lb. | 0 0 5  | to 0 0 6  |
| Diethylaniline .....               | lb. | 0 7 0  | to 0 8 0  |
| Dinitrobenzol .....                | lb. | 0 1 4  | to 0 1 6  |
| Dinitrochlorobenzol .....          | lb. | 0 1 2  | to 0 1 3  |
| Dinitronaphthalene .....           | lb. | 0 2 0  | to 0 2 3  |
| Dinitrotoluol .....                | lb. | 0 1 10 | to 0 2 0  |
| Dinitrophenol .....                | lb. | 0 1 10 | to 0 2 0  |
| Dimethylaniline .....              | lb. | 0 2 9  | to 0 3 0  |

|                                    | per | £ s. d. | £ s. d.   |
|------------------------------------|-----|---------|-----------|
| Diphenylamine .....                | lb. | 0 3 0   | to 0 3 3  |
| H-Acid .....                       | lb. | 0 7 6   | to 0 8 0  |
| Metaphenylenediamine .....         | lb. | 0 4 6   | to 0 4 9  |
| Monochlorobenzol .....             | lb. | 0 0 9   | to 0 0 10 |
| Naphthionic acid, crude .....      | lb. | 0 3 6   | to 0 3 9  |
| Naphthylamin-di-sulphonic acid ..  | lb. | 0 4 6   | to 0 5 0  |
| Nitronaphthalene .....             | lb. | 0 1 2   | to 0 1 6  |
| Nitrotoluol .....                  | lb. | 0 1 3   | to 0 1 6  |
| Orthoamidophenol .....             | lb. | 0 18 0  | to 1 0 0  |
| Orthodichlorobenzol .....          | lb. | 0 1 1   | to 0 1 3  |
| Orthotoluidine .....               | lb. | 0 2 0   | to 0 2 3  |
| Orthonitrotoluol .....             | lb. | 0 1 6   | to 0 1 9  |
| Para-amidophenol, base .....       | lb. | 0 14 0  | to 0 15 0 |
| Para-amidophenol, hydrochlor. .... | lb. | 0 15 6  | to 0 16 0 |
| Paradichlorobenzol .....           | lb. | 0 0 4   | to 0 0 5  |
| Paranitraniline .....              | lb. | 0 4 0   | to 0 4 6  |
| Paranitrotoluol .....              | lb. | 0 5 3   | to 0 5 6  |
| Paraphenylenediamine, distilled .. | lb. | 0 14 0  | to 0 15 9 |
| Paratoluidine .....                | lb. | 0 7 0   | to 0 7 6  |
| Phthalic anhydride .....           | lb. | 0 6 6   | to 0 7 6  |
| Resorcin, technical .....          | lb. | 0 11 0  | to 0 12 0 |
| Resorcin, pure .....               | lb. | 0 17 6  | to 1 0 0  |
| Salicylic acid .....               | lb. | 0 2 4   | to 0 2 6  |
| Salol .....                        | lb. | 0 4 6   | to 0 5 0  |
| Sulphanilic acid, crude .....      | lb. | 0 1 2   | to 0 1 3  |
| Tolidine, base .....               | lb. | 0 9 0   | to 0 10 0 |
| Toluidine, mixture .....           | lb. | 0 2 9   | to 0 3 0  |

## Hours and Wages

## Two New Government Bills

THE Bill to regulate the number of hours of employment, introduced in the House of Commons by Sir Robert Horne on Monday, provides that the number of working hours (exclusive of recognised intervals for meals) in any week shall not in the case of any person to whom the measure applies exceed forty-eight, and no person may in any week be employed in excess of the statutory working week. Power to vary normal hours or grant exceptions is given to the Home Secretary or Minister of Labour where a recommendation to that effect has been made to him by a Joint Industrial Council, Conciliation Board, or Trade Board, or an agreement has been arrived at between organisations of employers and workers in the class of employment in question. Any hours worked by any person in excess of the statutory working week shall be regarded as overtime and the decision as to the amount of overtime and the conditions under which it may be worked rests with the Home Secretary or the Minister of Labour. The payment for overtime shall in no case be at a rate of less than 25 per cent. in excess of the normal time rate, but any more favourable custom prevailing in any class of employment shall not be affected. The penalty for contravening the provisions of the Act is a fine not exceeding £10 for each offence.

## Minimum Rates of Wages

The Minimum Rates of Wages Commission Bill, which was also introduced on Monday, authorises the appointment of Commissioners, consisting of a chairman and such other persons as His Majesty may think fit, for the purpose of:

(a) Inquiring into and deciding what such minimum time rates of wages should be, regard being had to the cost of living in the various districts, and any other matters which appear to the Commissioners relevant;

(b) Inquiring into and making recommendations as to the methods and successive steps by which such minimum time rates of wages should be brought into operation, and the machinery by which they may be varied as and when occasion requires;

(c) Inquiring into and making recommendations as to the granting of exemptions from the rates so fixed in the case of infirm and incapable workers and in other exceptional cases, and the methods by which such exemptions should be granted;

(d) Making recommendations as to the legislation necessary for such purposes as aforesaid (whether by amendment of the Trade Boards Act, 1909 and 1918, and other enactments relating to minimum rates of wages or otherwise), and what amendments or the law, if any, are desirable.

The Commissioners may by order require the production of documents and the attendance of witnesses, any person failing to comply with such order or giving false or misleading evidence being liable to a fine of £50, or imprisonment for a term not exceeding one month.



## Company News

**BRADFORD DYERS' ASSOCIATION.**—Dividend on the Ordinary shares for the half-year to June 30 last at the rate of 7 per cent. per annum, the same as a year ago. Dividend warrants will be posted on September 1.

**ELECTRO BLEACH AND BY-PRODUCTS.**—The directors have declared an interim dividend in respect of the current year of 3½ per cent., less tax at 6s. in the £, on preference shares, payable Sept., to holders on the register August 15.

**BROKEN HILL PROPRIETARY CO.**—The net profit for the year ended May 31, amounted to £652,342, against £359,706, after deducting depreciation £27,614, against £12,603; Debenture interest £49,679, against £27,309; and sinking fund £53,000 against £26,500. The sum of £527,069 has been expended on plant at the steel works.

**UNITED STEEL COMPANIES.**—The report for the period from incorporation to June 30 last, states that the condition of the company is satisfactory, and the directors propose that the surplus of £357,344 be applied in payment of final dividends on the preference shares at 6 per cent., and on the ordinary shares at 10 per cent. per annum, leaving £63,950 to be carried forward. Meeting, Cutlers' Hall, Sheffield, August 27, noon.

**BRITISH MOTOR SPIRIT SYNDICATE.**—The Syndicate has issued a circular to the shareholders which states that negotiations have been concluded with Mr. H. C. Pierce, of the Pierce Oil Corporation, whereby Mr. Pierce or his corporation are to become majority subscribers for cash of the syndicate's capital of £250,000, and will supply a minimum of 12,000,000 gallons of petrol per annum, for which the syndicate will act as distributing agents.

**SPIES PETROLEUM.**—The Spies Petroleum Co., Ltd., announces an issue of 253,750 shares of 10s. each at par, payable in full upon application. The issued capital at present amounts to £1,015,000, represented by 2,030,000 shares; 30,000 of these shares were subscribed for privately during March of this year at par to provide for immediate requirements. In consideration of this issue options on a further 45,000 shares were given to the allottees at par and over.

**OIL TRUST, LTD.**—Mr. Lewis Hamilton's report on the 12,000 acres of oil lands owned by Oil Trust, Ltd., is expected towards the end of the month; meanwhile, the company is devoting its attention to the production of asphalt. Mr. W. H. Goodchild, in his recent report, said: "To give any accurate estimate of the total probable asphalt on the property is manifestly impossible, but it is a fair inference from the geological evidence that the quantities may well run into millions of tons." In the near future the Brown Vein, which he expects to yield 600,000 tons, is to be opened up.

**AMMONIA SODA CO.**—The annual report of the Ammonia Soda Co., Ltd., of Lostock, Northwich, shows, after putting £9,300 to general reserve for excess profits duty, and nearly £8,000 to depreciation, &c., an available balance of £35,000. The directors propose a dividend on the preference capital of 6 per cent., less tax, writing off £15,000 on suspense account and carrying forward £15,000. The report says that since the war, the heavily increased costs, the decline in demand and in the market price, and the bad state of the plant made manufacture impracticable. Work was stopped in March, and to prevent dissipation of assets a voluntary liquidation of the company is now proposed.

**BULLOCK, LADE & CO.**—The report for the year to July 31 last, states that the net profit, including the balance brought in, and after making provision for excess profits duty up to July 31, is £110,876. After providing for debenture interest, preference dividend, interim dividend on the ordinary shares, directors' fees, and income-tax, writing £10,000 off the distilleries, plant, machinery, &c., and setting aside £10,000 to insurance reserve, the directors add £20,000 to reserve, making it £170,000, and recommend a further dividend on the ordinary shares of 15 per cent., less tax, making 20 per cent. for year, leaving £12,815 to be carried forward. Meeting, 10, Bothwell Street, Glasgow, August 28, noon.

**TEHDY MINERALS.**—A circular to the shareholders of Tehdy Minerals, Ltd., states that the board has entered into a contract for the purchase from Viscount Clifden of the whole of the mineral rights, including china clay, of the Lanhydrock Estate in the County of Cornwall (other than the small parish of Lanhydrock) in consideration of payment in cash of £10,000, and an allotment at par of 190,000 fully-paid shares of the company. The board have made arrangements whereby 40,000 of these at par shall be offered as rights to the registered holders on the 28th inst. of the subscribed shares in Tehdy Minerals at the rate of one new share for each share held. On completion of the purchase Major the Hon. Victor Agar-Robartes and Mr. John Gilbert (Viscount Clifden's mineral agent) will join the board. To provide for the purchase consideration, it is proposed to increase the capital of the company to £300,000, and an extraordinary general meeting will be held at the London office of the company, 62, London-wall, E.C., on Thursday, August 28, at noon, when a resolution will be proposed that the capital of the company be increased to £30,000 by the creation of 200,000 new shares of £1 each.

## Stocks and Shares

### Commercial, Industrial, &c.

|   | Aug. 13.      | Aug. 20.      |
|---|---------------|---------------|
| Alby United Carbide Factories, Lim., Ord.                               | 7-1           | 7-1           |
| Associated Portland Cement Manufrs. (1900.)                             |               |               |
| Lim., Ord.  | 81-8½         | 81-9 1/16     |
| Bell's United Asbestos Co., Lim., Ord.                                  | 2-2½          | 2-2½          |
| Bleachers' Association, Lim., Ord.                                      | 1 1/16-1 1/8  | 1 1/16-1 1/8  |
| Borax Consolidated, Lim., Prefd. Ord.                                   | 4½-4½         | 4½-4½         |
| Bradford Dyers' Assoc. Lim., Ord.                                       | 2 1/16-2 1/16 | 2 1/16-2 1/16 |
| British Aluminium Co., Lim., Ord.                                       | 1 1/16-1 1/16 | 1 1/16-1 1/16 |
| British Oil and Cake Mills, Lim., Ord.                                  | 2 1/16-2 1/16 | 2 1/16-2 1/16 |
| British Portland Cement Manufrs., Lim., Ord.                            | 32/6-34/6     | 33/6-35/6     |
| Brunner, Mond & Co., Lim., Ord.   | 2 1/16-2 1/16 | 2-2 1/16      |
| Castner-Kellner Alkali Co., Lim.  | 2½-2½         | 2½-2½         |
| China Clay Corporation, Lim., Ord.                                      | 1-1           | 1-1           |
| Cook (Edward) & Co., Lim., 4% 1st Mort.                                 |               |               |
| Deb. Stock Red.   | 57-61         | 57-61         |
| Courtaulds, Lim.  | 9½-10½xd      | 9½-10½        |
| Crosfield (Joseph) & Sons, Lim., Cum. 6% Prefd.                         | 7-1½          | 7-1½          |
| Curtis & Harvey, Lim.   | 2 1/16-2 1/16 | 2 1/16-2 1/16 |
| Explosives Trades, Lim., Ord.   | 19/6-20/6     | 20/6-21/6     |
| Field (J. C. & J.), Lim., Ord.  | 7-7           | 7-7           |
| Greenwich Inland Linoleum (Fredk. Walton's New Patents) Co., Lim., Ord. | 1-1           | 1-1           |
| Harrisons & Crosfield, Lim., 10% Cum. Prefd. Ord.                       | 1 1/16-1 1/16 | 1 1/16-1 1/16 |
| India Rubber, Gutta Percha and Tel. Wks. Co., Lim., Ord.                | 16½-17½       | 16½-17½       |
| Lawes' Chemical Manure Co., Lim., Ord.                                  | 6-6½          | 6-6½          |
| Lever Bros., Lim., 6% Cum. "A" Prefd.                                   | 19/9-20/3     | 20/0-20/6     |
| Do. 6½% Cum. "B" Prefd.   | 19/10½-20/4½  | 20/0-20/6     |
| Magadi Soda Co., Lim., Ord.   | 1 1/16-1 1/16 | 1 1/16-1 1/16 |
| Manganese Bronze and Brass Co., Lim., Ord.                              | 11-11         | 11-11         |
| Maypole Dairy Co., Lim., Defd. Ord.                                     | 1-1           | 1-1           |
| Mond Nickel Co., Lim., 7% Cum. Prefd.                                   | 1-1½xd        | 1-1½          |
| Do. 7% Non. Cum. Prefd.   | 1 1/16-1 1/16 | 1 1/16-1 1/16 |
| Pacific Phosphate Co., Lim., Ord.                                       | 5½-5½xd       | 5½-5½         |
| Power-Gas Corporation, Lim., Ord.                                       | 4-4           | 4-4           |
| Price's Patent Candle Co., Lim.   | 41-43         | 41-43         |
| Salt Union, Lim., Ord.  | 1 1/16-1 1/16 | 1 1/16-1 1/16 |
| United Alkali Co., Lim., Ord.   | 1½-1½         | 1½-1½         |
| Val de Travers Asphalt Paving Co., Lim.                                 | 18-18         | 18-18         |
| Van den Berghs, Lim., Ord.  | 3 1/16-3 1/16 | 3 1/16-3 1/16 |
| Walkers, Parker & Co., Lim.   | 1½-1½         | 1½-1½         |
| Welsbach Light Co., Lim.  | 2 1/16-2 1/16 | 2-2½          |

### Gas, Iron, Coal and Steel

|  |                 |             |
|--|-----------------|-------------|
| Armstrong (Sir W. G.) Whitworth, Ltd., Ord.        | 34/9-35/9       | 38/6-9/11   |
| Ebbw Vale Steel, Iron & Coal Co., Lim., Ord.       | 1 1/16-1 1/16xd | 1½-1 1/16   |
| Gas Light and Coke Co., Ordinary Stock (4% Stand.) | 50-53 d         | 51-54       |
| Hadfield's, Limited, Ordinary                      | 1 1/16-1 1/16xd | 38/9-39/9   |
| South Metropolitan Gas Co., Ordinary (4% Stand.)   | 52-55           | 51-54xd     |
| Staveley Coal & Iron Co., Lim., Ord.               | 1 1/16-1 1/16   | 1½-2        |
| Vickers, Limited, Ordinary                         | 34/6-35/6       | 34/6-35/6xd |

### Mines, Nitrate, &c.

|   |           |           |
|---|-----------|-----------|
| Anglo-Chilian Nitrate and Rly. Co., Ltd., Ord.                            | 13½-14½   | 13½-14½   |
| Antofagasta Nitrate Co. Compania de Salitres de Antofagasta) 5½% 1st. Mt. |           |           |
| Debs. Red.  | 88-93     | 88-93     |
| Lagunas Nitrate Co., Lim.   | 1½-1½     | 1½-1½     |
| Rio Tinto Co., Lim., Ord. (Bearer)  | 57-59     | 55-57     |
| Tarapacá and Tocopilla Nitrate Co., Lim.                                  | 14/6-15/6 | 14/6-15/6 |

### Oil and Rubber

|  |               |             |
|--|---------------|-------------|
| Anglo-Java Rubber & Produce Co., Lim.  | 6/14-6/10½    | 6/7½-7/1½   |
| Anglo-Malaya Corporation, Ltd., Ord.   | 5/6-6/6       | 5/0-6/1     |
| Anglo-Malay Rubber Co., Lim.   | 13/0-13/6     | 13/3-13/9   |
| Anglo-Persian Oil Co., Lim., Cum. 6% Part.                                   | 1 1/16-1 1/16 | 1½-1 1/16xd |
| Burmah Oil Co., Ltd., Ord.   | 13½-13½       | 12½-14½     |
| Chersonese (F.M.S.) Estates, Lim.  | 3/10½-4/1½    | 3/10½-4/1½  |
| Linggi Plantations, Lim., Ord.   |               |             |
| Mexican Eagle Oil Co., Lim. (Cia Mexicana de Pet. "El Aguila" S.A.) Ordinary | 9-8           | 8½-8½       |
| "Shell" Transport and Trading Co., Lim., Ord.                                | 8½-8½         | 8½-8½       |
| Do. 5% Cum. Prefd.   | 9½-9½         | 9½-9½       |

## Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

### LONDON GAZETTE

#### Partnerships Dissolved

HUSSEY, George Frederick William, WARR, Frank Hewitt, and HARMAN, Charles Ambrose, oil, colour, lead, glass and paper merchants, 46-48, Orchard Lane, Southampton, under the style of J. C. Munday & Co., by mutual consent as and from August 1st, so far as regards the said Frank Hewitt Warr who retires from the firm. All debts received and paid by George Frederick William Hussey and Charles Ambrose Harman, who will carry on the business in partnership under the style of J. C. Munday & Co.

DEAN, Henry, and HOWORTH, Edwin, tanners, carriers, leather merchants, &c., Scatcliffe Tannery, Todmorden, under the style of Dean, Howarth & Co., by mutual consent as and from July 30, All debts received and paid by Edwin Howorth.

#### Companies Winding Up Voluntarily

THE LONDON AND MAIKOP OIL CORPORATION, LTD.—Mr. Albert Edwards Cave, Sun Court, Cornhill, London, E.C., F.C.A., appointed liquidator. Meeting of creditors at the offices of the company, 20, Copthall Avenue, London, on Tuesday, September 2, at 12 noon.

NEW SELPHOSA SALT CO., LTD.—Mr. Thomas Frederick Wild appointed liquidator.

#### Notice of Dividend

CLARKE, Sidney, residing at 2, Northampton Gardens, St. Helen's Road, and trading at 28, Waterloo Street, Swansea, oil, colour and glass merchant, &c. 1 5-6d. supplemental, August 23, 1919, Government Buildings, St. Mary Street, Swansea.

#### Appointment of Liquidator

THE OOWANA SOAP CO., LTD., 10 Moorgate Street, London. James Durie Pattullo, 65, London Wall, London, E.C. 2, appointed Liquidator, July 4.

#### Liquidators' Notices

ROUMANIAN PIPELINE AND TRADING CO., LTD.—A general meeting of members will be held at 54, New Broad Street, London, E.C., on Friday, September 19, at twelve noon. A. E. Rigden, Liquidator.

THE CLEMENT CASTING AND METAL CO., LTD.—A meeting of creditors will be held at 14, New Street, Birmingham, on Wednesday, August 27, at 3 p.m. E. Hardy, Liquidator.

#### Companies Winding Up

THE MINBU OIL CO. OF BURMA, LTD.—Mr. Robert Millar Edington, Accountant, 175, West George Street, Glasgow, appointed Liquidator. Meeting of creditors at 175, West George Street, Glasgow, on Wednesday, August 20, 12 noon.

GRAYS CHEMICAL WORKS, LTD.—A petition for the winding-up of the above named Company by the High Court of Justice was, on August 8, presented by Dr. Gilbert Thomas Morgan, 13, Elms Avenue, Muswell Hill, London, N., a creditor of the company, and the petition is directed to be heard before the Court sitting at the Royal Courts of Justice, Strand, London, on October 14.

#### Mortgages and Charges

[NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, created after July 1st, 1908, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July 1, 1908, require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an \*—followed by the date of the Summary, but such total may have been reduced since such date.]

ABBOTT GLASS CO., LTD., LONDON, S.E.—Registered August 8, £800 debts, part of £4,000; general charge. \*Nil. October 2, 1918.

BROOKES CHEMICALS, LTD., LIGHTCLIFFE.—Registered August 11, £50,000 debts; general charge. \*Nil. January 14, 1919.

LONDON CHEMICAL WORKS, LTD., SOUTHALL.—Registered August 6, £3,361 17s. 9d. mort., to R. W. Baxter, South Lodge, Southall, and ano.; charged on land at Southall. \*£600. November 26, 1918.

UNITED KINGDOM GLASS CO., LTD., LONDON, E.C.—Registered August 5, charge securing all moneys advanced or to be advanced, to Watney, Combe, Reid & Co., Pimlico; charged on three messuages, known as "Sunnyside," Weybourne, and Elmira, Red Mead Road, Harlington. \*Nil. September 4, 1918.

### New Companies Registered

The following list has been prepared for us by Jordan & Sons, Ltd. company registration agents, 116 and 117, Chancery Lane, London W.C. 1:—

APEDAIE SLAG & TAR MACADAM CO., LTD.—Dealers in all kinds of slag, limestone, &c. Nominal Capital, £25,000 in 25,000 Ordinary shares of £1 each. Qualification of Directors £25. Directors to be appointed. Remuneration of Directors to be voted by Company in General Meeting. Subscribers: S. H. Johnson, 31, Trinity Road, Birchfield, Birmingham; W. V. Fielding, Alton, Staffs.

BURT BROTHERS, LTD.—Coppersmiths, Metal spinners, stamped brassfounders, and non-ferrous sheet metal workers. Nominal capital £50,000 in 25,000 Ordinary shares and 25,000 Preference shares of £1 each. Directors: H. W. Southall, Crescent Copper Works, Edward Street, Birmingham; F. V. Wynn, Crescent Copper Works, Edward Street, Birmingham; H. Harris, Victorian Lodge, Shirley Road, Acocks Green, Birmingham; F. W. H. Harris, Enville, Warwick Road, Acocks Green, Birmingham. Qualification of Directors 500 ordinary shares.

BURY WOOL CO., LTD., Hinds Mill, Elton, Bury, Lancaster.—Wool merchants and other fibrous substances, and the preparation, dyeing or colouring of any of the said, and the business of Fellmongers, dealers in hides, &c. Nominal Capital, £10,000 in 10,000 shares of £1 each. Directors: G. Hey, 90, Hawthorne Road, Poole, Liverpool (Gov. Dir.); W. Hey, 8, Victoria Place, Mottram-in-Longdendale; H. Hey, Hinds Village, Eldon, Bury. Qualification of Directors 100 shares.

FRANKLIN CHEMICAL CO., LTD.—Manufacturers and Dealers in Chemicals, drugs, &c. Nominal Capital, £20,000 in 20,000 of £1 each. Directors to be appointed by Subscribers. Qualification of Directors £1. Remuneration of Directors to be voted by Company in General Meeting. Subscribers: E. J. Alldis, 18, Macdonald Road, Forest Gate, E.7; G. Dickson, Inselheim, Canvey Island, Essex.

LEWIS & HENSON, LTD.—Glass, china and earthenware merchants. Nominal Capital, £2,000 in 2,000 shares of £1 each. Directors: H. L. Lewis, 9, Beech Grove, Chorlton-on-Medlock, Manchester; J. F. Henson, 33, All Saints Road, St. Annes-on-the-Sea. Qualification of Directors £150.

J. R. MORRIS, LTD.—Paint and colour manufacturers and Merchants, &c. Nominal Capital, £1,000 in 1,000 Ordinary shares of £1 each. Directors: J. R. Morris, 51, Oxford Road, Smethwick; J. Roberts, The Leasowes, West Bromwich. Qualification of Directors 100 shares.

RELANCE FUEL CO., LTD.—Manufacturers and Dealers in briquettes and patent fuels, colliery proprietors, iron and steel masters, &c. Nominal Capital, £375,000 in 365,000 shares of £1 each and 200,000 shares of 1s. each. Directors: H. Houlder, 17, St. Helens Place, E.C.; W. H. Dixon, 81, Fenchurch Street, E.C.; F. M. Crisp, 5, Landsdowne Road, W.11. Qualification of Directors £500. Remuneration of Directors £300 each. Chairman £500.

GLASS RESEARCH ASSOCIATION, 51, Lincoln's Inn Fields, W.C.—To promote research and other scientific work in connection with the glass trade and industry. Every member to contribute a sum not exceeding £5 if necessary. Directors: F. Wood, Barnsley, glass manufacturer; A. Colefax, K.C., 1, Essex Court, Temple, E.C.; E. F. Oldham, 51, Lincoln's Inn Fields, W.C., solicitor; G. E. Alexander, 195, Strand, W.C., glass manufacturer; J. Forster, St. Helens, glass manufacturer; M. W. Travers, Highgate, N., consulting chemist; G. Hughes, Great Hampden, lamp-blown glass manufacturer; A. C. Towers, Dalston Junction, N., bottle manufacturer; C. Wilson, Lemington-on-Tyne, glass manufacturer; F. J. Powell, Whitefriars Glass Works, E.C., glass manufacturer; W. J. Asquith, Redfearn Bros., Ltd., Parnsley, glass bottle manufacturer; J. Moncrieff, North British Glass Works, Perth, glass manufacturer; E. J. Purser, Sunderland, glass manufacturer, &c.; F. G. Clark, (Beaton, Clark & Co.) Rotherham, secretary and chemist; B. Richardson, Wordsley, near Stourbridge, glass manufacturer; W. H. Stuart, Wordsley, Stourbridge, glass manufacturer; S. N. Jenkinson, Norton Park, Edinburgh, glass manufacturer.

GEORGE J. TAYLOR & CO., LTD., 384, London Road, Lowfield, Sheffield.—Wholesale chemists and druggists and manufacturers and dealers in Methylated spirits and paint and enamel manufacturers. Directors: G. J. Taylor, 384, London Road, Lowfields; Bertha L. Taylor, 384, London Road, Lowfields. Qualification of Directors, one share.

### The Affairs of Richard Maloney.

The public examination of Richard Maloney, 11, Aberdeen Park, Highbury, was held on August 19, before Mr. Registrar Francke, at the London Bankruptcy Court. The accounts showed liabilities £5,293 15s. 9d., against assets, good book debts, £71. Questioned by Mr. F. T. Garton, Official Receiver, the debtor said he was a solicitor by profession, and had recently been employed by the Admiralty at

a remuneration of £25 per month. In March, 1917, he became interested in certain secret processes for the manufacture of glaze and enamel, and in the following December he agreed to purchase for £4,000 the interest (two-fifths) of another person therein. It was further agreed that the £4,000 was to be satisfied as to £3,000 in cash and 2,500 £1 fully-paid shares in a company proposed to be formed to acquire one of the processes. That company was to have a nominal capital of £100,000, and witness was to receive 40,000 shares as one of the vendors. No company, however, was floated, and in July he was brought to the Court on a creditor's petition. Witness attributed his insolvency to loss in connection with the secret processes, the value of which were, as he alleged, misrepresented to him, and to his liability for damages and costs in a libel action brought against him last November. He lost altogether £5,400 over the secret processes, but that included £2,425 obtained from other persons.

The examination was concluded.

THE BRITISH OPTICAL ASSOCIATION is applying to the Privy Council for the grant of a charter of incorporation.

THE CHEMICALS SECTION OF THE DISPOSAL BOARD announces that there is a considerable stock of charcoal available.

A COMPANY HAS BEEN FORMED for the utilization of the slate waste of North Wales by turning it into asphalt, bricks, abrasive soap, linoleum, and other goods.

EIGHTEEN GERMAN EXPERTS IN DYE-STUFFS, accompanied by Dr. Psuff and Dr. Lubsen, directors of the Essen Coal Syndicate, and Herr Hasslather, director of jurisprudence, have left Versailles for Berlin.

THE UNIVERSITY OF HONG-KONG is about to appoint professors of physics and chemistry, and lecturers in biology, engineering, electrical engineering, mathematics, political science, and education.

THE JAMES WATT CENTENARY CELEBRATION will take place on September 16, 17 and 18 in the Birmingham district. An interesting programme has been arranged. Among the societies who are co-operating are the Institute of Chemistry and the Society of Chemical Industry.

SOME 400 WORKERS have come out on strike at the Cape Asbestos Company's works, at Barking, in support of demands for a 48-hour week, a week's holiday with pay, and an increase of 5s. per week for women employees. Negotiations were in progress on Wednesday.

THE DELAY IN THE PUBLICATION of the report of the Nitrogen Products Committee is attributed to the amount of work that has been necessary in the preparation of an index. This is believed to be now nearly complete. The issue of the report is awaiting a definite instruction from the Minister of Munitions. The report, which is dated May last, dealt with the project for installing a plant in Great Britain for the fixation of nitrogen from the atmosphere, and that it views as feasibly the Haber, or synthetic ammonia, process. The utilization of water power for the purpose does not take a prominent place in the recommendations. The report is a final and not an interim one, but is believed that it contemplates the resumption investigations into both catalytic fixation and the use of nitrogen products in industry generally.

### Situations Wanted

(Twenty-seven words, 2s.; every additional nine words, 6d.)

**WANTED.**—Gentleman with chemical training who has an up-to-date knowledge of the commercial side of heavy chemicals, to work on a committee with three or four others—to meet fortnightly—to advise lines of development in heavy chemical manufacture.—Box No. 14, CHEMICAL AGE Offices, 8, Boulevard St., E.C. 4.

**UNIVERSITY COLLEGE, London, Graduate seeks** post as Works Manager or Chemist-in-Charge. Four years Chemist-in-Charge of Nitro-Cellulose Factory, G/C and Solubles; Nitric Acid Making; Denitration; Acid Concentration, &c. Organisation of Modern Works' Routine and Returns a strong point.—Apply Box No. 19, CHEMICAL AGE Offices, 8, Boulevard Street, E.C. 4.

**CHEMIST** with engineering and commercial ability, who has been in charge of manufacturing Heavy Chemicals, desires responsible position in chemical or metallurgical industry. Salary £600.—Reply Box No. 15, CHEMICAL AGE Offices, 8, Boulevard Street, E.C. 4.

### Notices

(Three lines, 3s.; each additional line, 1s.)

G.  R.

By Direction of the Disposal Board, Ministry of Munitions.  
AT THE SOUTH METROPOLITAN GAS CO'S, WORKS,  
OLD KENT ROAD, LONDON, S.E.

To Chemical Manufacturers, Dye Works, Laundries, Engineers, Machinery Dealers and others.

**HENRY BUTCHER & Co.** have received instructions to sell by Auction on the above premises on Tuesday, August 26th, 1919, at 11 a.m., the **EXTENSIVE PLANT and MACHINERY** as used in the Manufacture of Synthetic Phenol comprising:

The nearly new **KESTNER EVAPORATING PLANT**, complete with all the necessary Apparatus, Tanks, Tubes, Receivers, Condensers, &c., capable of dealing with about 10,000 gallons Caustic Soda per 24 hours; 100 H.P. **HORIZONTAL STEAM CONDENSING ENGINE** by Tangye, 9 ft. x 6 ft.; 9 1/2 in. diameter **CENTRIFUGAL HYDRO EXTRACTORS** with plate copper baskets, by Manlove Alliott & Co.; 8 **STEAM JACKETED SULPHONATORS**, with special stirring gear (about 800 gallons capacity); 6 **REFLUX CONDENSERS** fitted with 2 in. lead coils in galvanised iron tanks; 22 **PITCH PINE VATS**, from 8 ft. to 10 ft. in diameter, assorted lead-lined and plain, and all fitted with Mixers and Gear complete; 8 ditto, new, unassembled; 8 **GRINDING MACHINES** (Follows and Bute), with spare parts; 2 3-ton **"WAYGOOD OTIS" HYDRAULIC LIFTS** complete; **HYDRAULIC ACCUMULATOR**, weighted for 650 lbs. per square inch; 2 3-ton **PLATFORM WEIGHBRIDGES** (Avery's); 19 C.I. **FUSION POTS**, 3 ft. 6 in. x 4 ft. 3 in., fitted with stirrers, bafflers, and gear complete; 4 M.S. **RIVETTED STILLS**, 6 ft. x 10 ft. deep; 8 C.I. **EVAPORATING PANS** 8 ft. x 6 ft., fitted with stirrers and gear; **HYDRAULIC PRESS**; 400 W.I. **TRAYS**, 4 ft. x 2 ft.; the new **OIL CAKE PRESSING PLANT**, by GREENWOOD & BATLEY, consisting of Distributing Pan, fitted self-contained Driving Gear; 2 **HYDRAULIC CAKE MOULDING MACHINES**; 4 **SELF-FLUSHING ANGLO-AMERICAN OIL CAKE PRESSES**, working up to 2 tons per square inch; **DOUBLE PARING MACHINE**; **SET HYDRAULIC PUMPS** for operating the above; **HIGH PRESSURE ACCUMULATOR**, 4 in. ram.

Also large quantities Steel Shafting Pulleys, Bearings, Belting Pumps, Lifting Tackle, Tools, Valves, Cocks, Fittings, Bricks, Timber, Steel Joists, etc., etc.

On view one week preceding Sale from 10 a.m. to 4 p.m. and morning of Sale.

Catalogues and all information from Henry Butcher & Co., Plant and Machinery, Valuers and Auctioneers, 63 and 64, Chancery Lane, London, W.C.2. Phone: Holborn 2295

### Situations Vacant.

(Three lines, 3s.; each additional line, 1s.)

Unless specially asked for, Original Testimonials should NOT be forwarded with Applications, but only copies of them.

### BOROUGH OF ROCHDALE.

#### GAS DEPARTMENT.

The Gas and Electricity Committee of the above Corporation invite applications for the position of Gasworks Chemist and Superintendent of the Tar and Sulphate Works connected with the Gasworks.

Applicants must have had practical experience in the management of Tar and Sulphate Works, and be competent to undertake all the necessary analyses in connection with those Works, and also such as may be required in the ordinary work of the Gas Department.

The person appointed will be required to devote the whole of his time to the duties of the position.

Applications, endorsed "Chemist," stating salary required, and accompanied by not more than two recent testimonials, must be addressed to Mr. T. Banbury Ball, the Engineer at the Gasworks, Rochdale, and must be sent in before noon on Wednesday, September 3rd, 1919.

By Order,  
WM. HENRY DICKSON,  
Town Clerk.

Town Hall, Rochdale,  
August 14th, 1919.

**WANTED Two DRAUGHTSMEN** used to Oil Mill Machinery. Permanent situation to suitable men. Apply, stating fully, age, experience, and salary required, to Box No. 18, CHEMICAL AGE Offices, 8, Boulevard Street, E.C. 4.

### For Sale or Wanted

(Three lines, 3s.; each additional line, 1s.)

**SPECTROSCOPES, MICROSCOPES**, bought, sold, and exchanged. Lis. free.—John Browning, 146, Strand, W.C.



